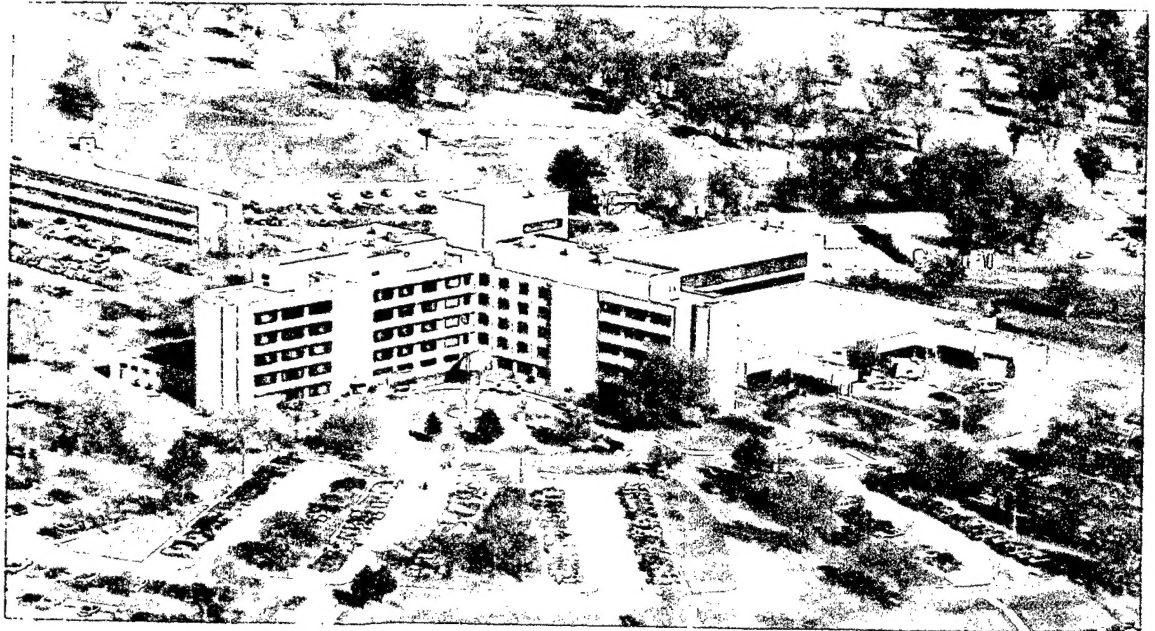


ENERGY ENGINEERING ANALYSIS PROGRAM

11-27A, Energy Surveys & Studies
Destroy when no longer needed
for current operations

FINAL SUBMITTAL



IRWIN ARMY COMMUNITY HOSPITAL FORT RILEY, KANSAS

PREPARED FOR

DEPARTMENT OF THE ARMY
KANSAS CITY DISTRICT
CORPS OF ENGINEERS
CONTRACT NO. DACA41-90-C-0114

PREPARED BY

MASSAGLIA.NEUSTROM.BREDSON, INC.
CONSULTING ENGINEERS
KANSAS CITY, MISSOURI

THE GAW COMPANY
ARCHITECTS

VOLUME 3 OF 3
PROJECT DOCUMENTATION
JANUARY 1992

Received 6/11/92

EXHIBIT A

Approved for public release
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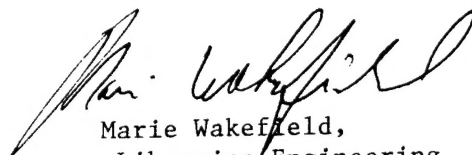


DEPARTMENT OF THE ARMY
CONSTRUCTION ENGINEERING RESEARCH LABORATORIES, CORPS OF ENGINEERS
P.O. BOX 9005
CHAMPAIGN, ILLINOIS 61826-9005

REPLY TO
ATTENTION OF: TR-I Library

17 Sep 1997

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Marie Wakefield,
Librarian Engineering

INDEX

PROJECT #1

WINDOW/DOOR UPGRADE

PROJECT #2

HVAC MODIFICATIONS

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BOILER CONTROLS

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BOILER BURNERS/MODULAR BOILER

PROJECT #5

CHILLER REPLACEMENT

FINAL QUALITY INSPECTED 2

19971017 166

1. WINDOW / DOOR UPGRADE

1. COMPONENT ARMY	FY 19 <u>95</u> MILITARY CONSTRUCTION PROJECT DATA			2. DATE 19 APR 1992 14 APR 1992
3. INSTALLATION AND LOCATION Fort Riley Kansas		4. PROJECT TITLE ECIP Window/Door Upgrade & Light Rev.		
5. PROGRAM ELEMENT	6. CATEGORY CODE 510 10	7. PROJECT NUMBER 40475	8. PROJECT COST (\$000) 230	
9. COST ESTIMATES				
ITEM	U/M	QUANTITY	UNIT COST	COST (\$000)
PRIMARY FACILITY Bldg 600 Mod	EA	1	183785	184 (814)
SUPPORTING FACILITIES Design Cost	LS	---	---	11 (11)
ESTIMATED CONTRACT COST				195
CONTINGENCY PERCENT (10.0%)				20
SUBTOTAL				215
SUPERVISION, INSPECTION & OVERHEAD (6.00%)				13
CATEGORY E EQUIPMENT				(0)
TOTAL REQUEST				228
TOTAL REQUEST (ROUNDED)				230
INSTALLED EQUIPMENT-OTHER APPROPRIATIONS				(0)
10. DESCRIPTION OF PROPOSED CONSTRUCTION This project will include installing double pane tinted glass in Building 600 and Building 610 and installing 2" thick spandrel panels in Building 610. It includes extending the main entry vestibule in Building 600 and adjusting the door hold open time for the emergency entry vestibule. It also includes installing occupancy sensors in offices containing one or two four-lamp fixtures in the 1975 addition.				
11. REQUIREMENT: PROJECT: Install double pane, tinted glass in Building 600 & 610. Renovate entry vestibules in Building 600 at main entrance and emergency entrance. Install wall mounted occupancy sensor light switches. REQUIREMENT: This project is required to reduce the gas and electrical consumption caused by excessive infiltration, high energy loss through single pane windows, and lights being left on when spaces are unoccupied.				

1. COMPONENT ARMY	FY 19 <u>95</u> MILITARY CONSTRUCTION PROJECT DATA		2. DATE 19 APR 1992 14 APR 1992												
3. INSTALLATION AND LOCATION Fort Riley Kansas															
4. PROJECT TITLE ECIP Window/Door Upgrade & Light Rev.		5. PROJECT NUMBER 40475													
<p>CURRENT SITUATION:</p> <p>Building 610 and portions of Building 600 now have single pane, clear glass windows. Building 610 also has clear storm windows. Generally one-half of the storms are up and one-half of the storms are down. The main entry of the hospital is not long enough to prevent both sets of doors being open at the same time, allowing a large amount of outside air to infiltrate into the building. The emergency room vestibule doors must be open at the same time but the amount of time could be reduced. Offices are generally occupied 10 hrs/day. Lights are on the entire time, although occupancy fluctuates throughout the day.</p> <p>IMPACT IF NOT PROVIDED:</p> <p>Failure to approve this project will result in the continued use of gas and electricity at a higher rate than necessary. It will also continue to inconvenience any handicapped user of the emergency room.</p> <p>ADDITIONAL:</p> <p>This project complies with the scope and design of CEHSU-FU-M, Energy Conservation Investment Program (ECIP) Guidance, that was in effect June 1991. The project has a Discounted Savings Ratio (SIR) of 1.64 and a simple payback of 9.94 years. The implementation of this project will provide an annual energy savings of 2990.5 MBTU and an annual dollar savings of \$20,443.</p> <p>Project validation will be through metering of electric consumption at the hospital and electric and gas consumption at the Energy Plant, review of boiler operating logs, and engineering calculations.</p> <table border="0"> <tr> <td>ESTIMATED CONSTRUCTION START:</td> <td>APR 1995</td> <td>INDEX:</td> <td>1992</td> </tr> <tr> <td>ESTIMATED MIDPOINT OF CONSTRUCTION:</td> <td>OCT 1995</td> <td>INDEX:</td> <td>2029</td> </tr> <tr> <td>ESTIMATED CONSTRUCTION COMPLETION:</td> <td>APR 1996</td> <td>INDEX:</td> <td>2055</td> </tr> </table>				ESTIMATED CONSTRUCTION START:	APR 1995	INDEX:	1992	ESTIMATED MIDPOINT OF CONSTRUCTION:	OCT 1995	INDEX:	2029	ESTIMATED CONSTRUCTION COMPLETION:	APR 1996	INDEX:	2055
ESTIMATED CONSTRUCTION START:	APR 1995	INDEX:	1992												
ESTIMATED MIDPOINT OF CONSTRUCTION:	OCT 1995	INDEX:	2029												
ESTIMATED CONSTRUCTION COMPLETION:	APR 1996	INDEX:	2055												

1. COMPONENT ARMY	FY 19⁹⁵ MILITARY CONSTRUCTION PROJECT DATA	2. DATE Rev. 4/92 3 Sept. 1991
3. INSTALLATION AND LOCATION Irwin Army Community Hospital Fort Riley, Kansas		
4. PROJECT TITLE Window/Door Upgrade		5. PROJECT NUMBER

SECOND FLOOR PLAN

BASEMENT FLOOR PLAN

1. COMPONENT ARMY	FY 19 <u>95</u> MILITARY CONSTRUCTION PROJECT DATA	2. DATE Rev. 4/92 3 Sept. 1991
3. INSTALLATION AND LOCATION Irwin Army Community Hospital Fort Riley, Kansas		
4. PROJECT TITLE Window/Door Upgrade		5. PROJECT NUMBER

INSTALL NEW INSULATED WALL PANEL @ THIS LOCATION (TYPICAL)

INSTALL NEW WINDOW @ THIS LOCATION (TYPICAL)

3RD. FLR.

2ND. FLR.

1ST FLR.

BUILDING ELEVATION # 610

1. COMPONENT ARMY	FY 19 <u>95</u> MILITARY CONSTRUCTION PROJECT DATA	2. DATE Rev. 4/92 3 Sept. 1991
3. INSTALLATION AND LOCATION Irwin Army Community Hospital Fort Riley, Kansas		
4. PROJECT TITLE Window/Door Upgrade	5. PROJECT NUMBER	

EXISTING VESTIBULE

NEW VESTIBULE

EXISTING COLUMNS

RELOCATED DOORS

EXISTING CANOPY ABOVE

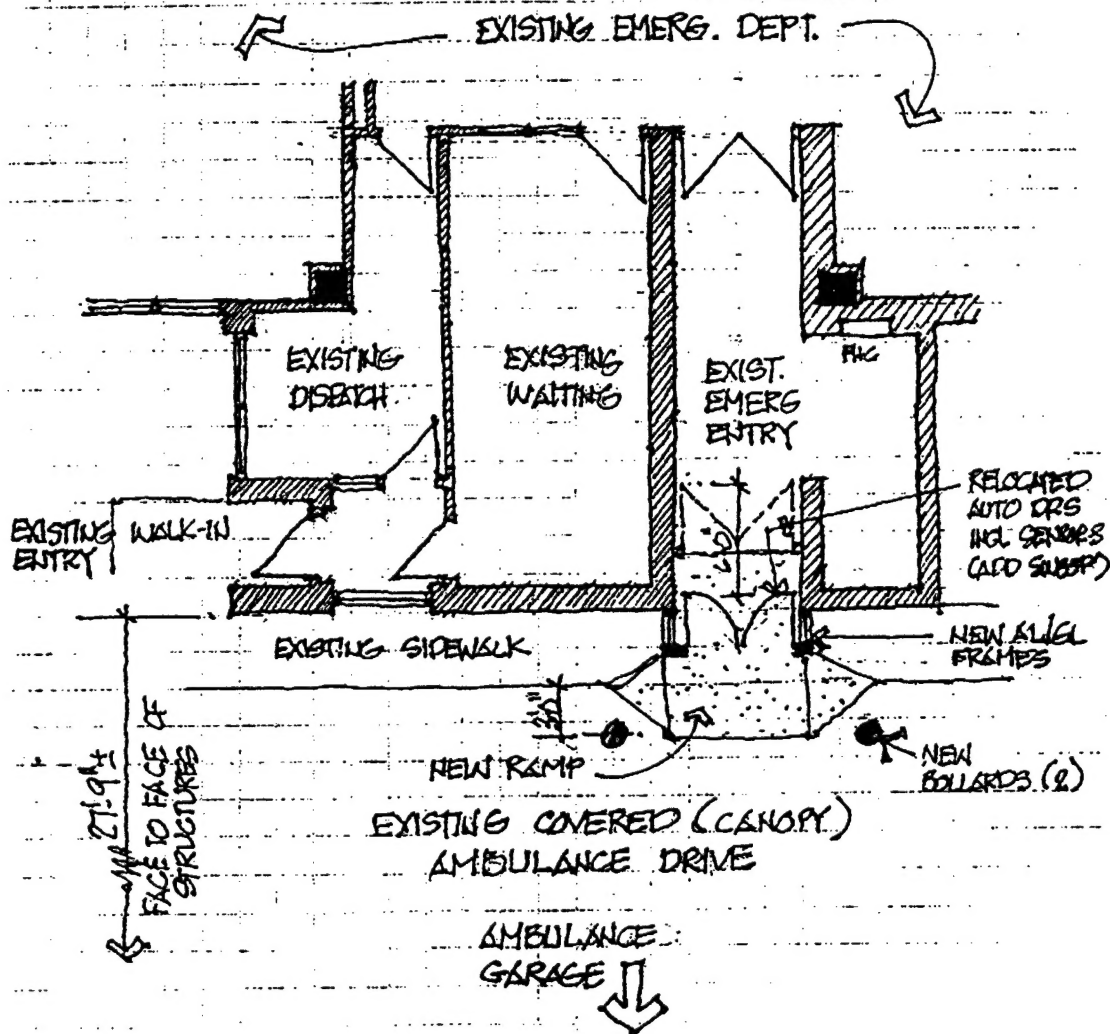
EXISTING SIDEWALK

NORTH

HOSPITAL ENTRY VESTIBULE
BUILDING NO. 600.
IRWIN ARMY COMMUNITY HOSPITAL
FT RILEY KANSAS

1. COMPONENT ARMY	2. DATE Rev. 4/92 3 Sept. 1991
3. INSTALLATION AND LOCATION Irwin Army Community Hospital Fort Riley, Kansas	
4. PROJECT TITLE Window/Door Upgrade	5. PROJECT NUMBER

AMBULANCE ENTRY REVISIONS
(GENERAL COMMENT -- ITEM -- NO. 21)
IACH - EEP



1. COMPONENT ARMY	FY 19⁹⁵ MILITARY CONSTRUCTION PROJECT DATA	2. DATE Rev. 4/92 3 Sept. 1991
3. INSTALLATION AND LOCATION Irwin Army Community Hospital Fort Riley, Kansas		
4. PROJECT TITLE Window/Door Upgrade		5. PROJECT NUMBER

FIRST FLOOR PLAN
BUILDING 600

INTRODUCTION

There are existing single pane windows in the 1955 portion of Building 600 with no thermal break. They are located in the following areas:

1. Second floor connecting corridor to Mechanical Equipment Room.
2. Second floor Chapel windows.
3. Dining Rooms.
4. Bakery.

Replacement windows for these areas would be 1" tinted insulating glass set in bronze aluminum window units containing thermal breaks.

The existing single pane clear window units with storms in Building 610 are also being replaced as part of this project. Tinted 1" insulated glass will be installed in 101 windows and 2" insulated wall panels will be installed in the remaining 230 units.

Hospital entry vestibules at the main entry and the emergency/ outpatient entrance would be revised to create effective entry vestibules. The main entry vestibule was visited and field measured. An approximate 9'-0" wide curved hospital entry vestibule 6'-0" long on one side and 8'-0" long on the opposite side was added as part of the 1975 expansion and renovation project. The doors are medium styled, bronze anode, set in the original anodized window wall frame system. The vestibule does not provide adequate depth to ensure exterior doors are closed before interior doors are open and vice versa, especially when wheelchair bound persons use the entrance.

The emergency/outpatient entrance vestibules were surveyed and field measured. The existing emergency entry doors consist of two pair of 3'-0" and 7'-0" glass doors in aluminum frames spaced 19'-4" apart. The exterior doors swing inward and the exterior doors swing outward which reduces the effective vestibule length to 13'-4". The doors are automatic. They are activated by two ceiling mounted motion detectors per door. Exterior doors are recessed in 2'-8" from the covered canopy. Both sets of doors stand open for 10 seconds due to the emergency nature of the door traffic. The present vestibule could be extended by 5'-0" in conjunction with adjusting the door hold-open devices to reduce the time by a maximum of five seconds.

The existing outpatient doors were surveyed and found to be manually operated with a 12'-0" vestibule. While push-button control would be an improvement for handicapped patients, no energy is saved based on current operation of the doors; therefore, no savings are calculated.

The TRACE 600 program was used to model Building 600 and 610 as they now operate in T0045080 ALT 1 and T0015080 ALT 1. The building operation with new window units was then computed in file T0045080 ALT 2 and T0015080 ALT 2.

Manual calculations were performed to calculate the savings based on reduced infiltration through the vestibules.

The lights in the 1975 addition offices were surveyed and found to remain on when sporadically unoccupied during the day. The light switches in these spaces could be replaced with occupancy sensors to turn the lights off when the spaces are unoccupied. Manual calculations were performed to determine the amount of energy saved.

LIFE CYCLE COST ANALYSIS SUMMARY

ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: Fort Riley, Ks. REGION NO.: 7 PROJECT NO.: 40475
 PROJECT TITLE: Window/Door Upgrade & Light Rev. FISCAL YR.: 1995
 DISCRETE PORTION NAME: Upgrade
 ANALYSIS DATE: 4-15-92 ECONOMIC LIFE 25 YEARS PREPARED BY: RDF

1. INVESTMENT

A. CONSTRUCTION COST	\$	181357	
B. SIOH	\$	10882	
C. DESIGN COST	\$	10882	
D. SALVAGE VALUE	-	\$	0
E. TOTAL INVESTMENT (1A + 1B + 1C - 1D)			\$ 203121

2. ENERGY SAVINGS (+) / COST (-)

ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	COST \$/MBTU/YR(1)	SAVINGS MBTU/YR(2)	ANNUAL \$ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	\$ 11.13	956	\$ 10638	15.04	\$ 159996
B. DIST	\$		\$		\$
C. RESID	\$		\$		\$
D. NG	\$ 3.59	2035	\$ 7305	18.92	\$ 138203
E. COAL	\$		\$		\$
F. TOTAL		2991	\$ 17943		\$ 298199

3. NONENERGY SAVINGS(+) / COST (-)

A. ANNUAL RECURRING (+/-)
 (1) DISCOUNT FACTOR (TABLE A) 14.68
 (2) DISCOUNTED SAVING/COST (3A X 3A1) \$ 33911

B. NONRECURRING SAVINGS (+) / COST (-)

ITEM	SAVINGS(+) COST(-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR(3)	DISCOUNTED SAVINGS (+) COST (-) (4)
(1) Caulking	\$ 4760	21	.39	\$ 1856
(2)	\$			\$
(3)	\$			\$
(4) TOTAL	\$ 4760			\$ 1856

C. TOTAL NONENERGY DISCOUNTED SAVINGS (+) / COST (-) (3A2+3BD4) \$ 35767

D. PROJECT NONENERGY QUALIFICATION TEST

(1) 25% MAX NONENERGY CALC (2F5 X .33) \$ 98406
 a. IF 3D1 IS = OR > 3C GO TO ITEM 4
 b. IF 3D1 IS < 3C CALC S1R = (2F5+3D1) / 1E =
 c. IF 3D1b IS = > 1 GO TO ITEM 4
 d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d / YEARS ECONOMIC LIFE) \$ 20443

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) \$ 333966

6. DISCOUNTED SAVINGS RATIO (IF < 1 PROJECT DOES NOT QUALIFY) (SIR) = (5 / 1E) = 1.64

7. SIMPLE PAYBACK PERIOD (ESTIMATED YEARS) SPB=1E/4 9.94

THE TRACE 600 COMPUTER PROGRAM WAS USED TO MODEL THE HOSPITAL WITH THE EXISTING WINDOWS IN TØØ45080 ALT 1. IN RUN TØØ45080, ALT. 2, THE BUILDING ENVELOPE INPUT WAS MODIFIED TO REFLECT 1-INCH TINTED, INSULATING GLASS IN ALUMINUM FRAMES WITH THERMAL BREAKS IN SECOND FLOOR CORRIDOR, SECOND FLOOR CHAPEL, DINING ROOM AND BAKERY AREAS. ELECTRICAL ENERGY AND GAS CONSUMPTION ARE REDUCED DUE TO THIS MODIFICATION.

ASSUMED CONDITIONS

DISTRICT PIPING LOSSES = 10%

HEAT EXCHANGER EFFICIENCY = 80%

GAS COST = \$ 3.7/MCF

ELECT COST = \$ 0.038/KWH

MAINTENANCE COST DIFFERENCE WAS DETERMINED TO BE INSIGNIFICANT.

ANNUAL NONRECURRING COST FOR WINDOW REPLACEMENT DUE TO BREAKAGE AND RECAULKING WAS DETERMINED TO BE THE SAME FOR THE EXISTING WINDOWS AND PROPOSED MODIFICATION.

WINDOW "U" = 0.57, SHADING COEFFICIENT (SC) = 0.4

BASED ON OUTPUT FROM TRACE 600 THE ENERGY SAVINGS IS AS FOLLOWS.

TØØ45080 ALT 1 KWH	8,230,699
TØØ45080 ALT 2 KWH	<u>2,195,004</u>
	35,695 KWH

TØØ45080 ALT 1 MCF	23,651
TØØ45080 ALT 2 MCF	<u>23,455</u>
	196 X 1.1 PIPING ÷ 0.8 HX EFF = 269.5 MCF

ANNUAL ENERGY SAVING

35,695 KWH x 3413 ^{BTU} /KWH	=	121.83 x 10 ⁶
269.5 MCF x 1.031 x 10 ⁶ ^{BTU} /MCF	=	277.85 x 10 ⁶
		<u>399.68 x 10⁶ BTU/YR</u>

ANNUAL DOLLAR SAVING

35,695 KWH x 0.038 \$/KWH	=	\$ 1356.41
269.5 MCF x 3.7 \$/MCF	=	<u>\$ 997.15</u>
		\$ 2353.56 / YR

T0045080 ALTI

Trane Air Conditioning Economics

V 600

By: MASSAGLIA-NEUSTROM-BREDSON

Trane Air Conditioning Economics

V 600

By: MASSAGLIA-NEUSTROM-BREDSON

PAGE 1

MONTHLY ENERGY CONSUMPTION - ALTERNATIVE 1

EXISTING EQUIPMENT

----- MONTHLY ENERGY CONSUMPTION -----

Month	ELEC	DEMAND	GAS	WATER
	On Peak (kWh)	On Peak (kW)		
Jan	463,533	950	62,466	129
Feb	418,459	950	48,678	117
March	516,532	1,186	29,563	164
April	564,637	1,235	18,502	339
May	803,170	1,866	540	1,030
June	921,231	2,109	0	1,457
July	1,071,386	2,269	0	1,883
Aug	1,034,599	2,241	0	1,753
Sept	823,980	1,978	198	1,164
Oct	612,446	1,274	14,442	442
Nov	499,557	1,179	30,922	151
Dec	501,171	1,166	38,531	144
Total	8,230,699	2,269	243,842	8,775

Building Energy Consumption = 164,830 (Btu/Sq Ft/Year)
 Source Energy Consumption = 345,363 (Btu/Sq Ft/Year)

Floor Area = 318,361 (Sq Ft)

T0045080 ALT 2

Trane Air Conditioning Economics

By: MASSAGLIA-NEUSTROM-BREDSON

V 600

PAGE 2

MONTHLY ENERGY CONSUMPTION - ALTERNATIVE 2

ECO 5 NEW WINDOWS IN BAKE,DINE,CHAPEL

----- MONTHLY ENERGY CONSUMPTION -----

Month	ELEC	DEMAND	GAS	WATER
	On Peak (kWh)	On Peak (kW)		
			(Therm)	(1000 G)
Jan	460,891	947	62,204	129
Feb	416,081	947	48,493	117
March	514,365	1,181	29,355	166
April	562,402	1,230	18,273	340
May	798,135	1,859	540	1,024
June	918,189	2,099	0	1,456
July	1,065,662	2,263	0	1,872
Aug	1,030,509	2,233	0	1,748
Sept	820,499	1,970	198	1,161
Oct	607,806	1,269	13,718	436
Nov	513,609	1,175	30,830	155
Dec	486,855	1,162	38,216	148
Total	8,195,004	2,263	241,826	8,751

Building Energy Consumption = 163,815 (Btu/Sq Ft/Year)
Source Energy Consumption = 343,548 (Btu/Sq Ft/Year)

Floor Area = 318,361 (Sq Ft)

COST ESTIMATE ANALYSIS										INVOITATION/CONTRACTOR		EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 5-800-2; the proponent agency is USACE.												January 1992		April 1992	
PROJECT		Irwin Army Community Hospital - EEAP								CODE (Check one)		DRAWING NO.		SHEET 1 OF 5 SHEETS	
LOCATION		Fort Riley, Kansas								<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> OTHER		ESTIMATOR		CHECKED BY	
TASK DESCRIPTION		QUANTITY		MH		TOTAL HRS		LABOR		EQUIPMENT		MATERIAL		SHIPPING	
		NO. OF UNITS	UNIT MEAS	UNIT	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	TOTAL	UNIT WT	TOTAL WT	
KINDOM REPLACEMENT															
SHEET 2 OF 5														7142	
SHEET 3 OF 5														4141	
SHEET 4 OF 5														4006	
SHEET 5 OF 5														2602	
SUBTOTAL														17891	
CONTRACTOR OH @ 15%														2684	
SUBTOTAL														20575	
CONTRACTOR PROFIT @ 10%														2057	
SUBTOTAL														22632	
CONTINGENCIES @ 5.5%														1245	
CONSTRUCTION COST														23877	
SIQH @ 6.0%														1433	
TOTAL THIS SHEET															

COST ESTIMATE ANALYSIS				INVOITATION/CONTRACTOR				EFFECTIVE PRICING DATE				DATE PREPARED	
For use of this form, see TM 5-900-2; the proponent agency is USACE.								January 1992				April 1992	
PROJECT				CODE (Check one)				DRAWING NO.				SHEET 2 OF 5 SHEETS	
LOCATION				<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C				ESTIMATOR				CHECKED BY	
Fort Riley, Kansas				<input type="checkbox"/> OTHER								R. D. Frymire	
TASK DESCRIPTION	QUANTITY		MH	LABOR		EQUIPMENT	MATERIAL		TOTAL	SHIPPING			
	NO. OF UNITS	UNIT MEAS		UNIT PRICE	COST		UNIT PRICE	COST		UNIT WT	TOTAL WT		
SECOND FLOOR CORRIDOR													
REMOVE EXISTING													
6'-3" H x 12'-0" L													
WINDOW SECTION													
TOTAL OF 3 SECT.	225	SF	—	.93	210	—	—	—	210				
INSTALL NEW BRONZE													
TINTED WINDOWS/W													
THERMAL BREAK &													
1-INCH INSULATING													
GLASS	225	SF	—	4.81	1083	—	—	25.2	5670	6753			
CAULK NEW WINDOWS	150	LF	—	1.01	152	—	—	0.18	27	179			
TOTAL THIS SHEET										7142			

COST ESTIMATE ANALYSIS										INVOITATION/CONTRACTOR		EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 5-800-2; the proponent agency is USACE.												January 1992		April 1992	
PROJECT Irwin Army Community Hospital - EEAP										CODE (Check one) <input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C		DRAWING NO.		SHEET 3 OF 5 SHEETS	
LOCATION Fort Riley, Kansas										<input type="checkbox"/> OTHER		ESTIMATOR		CHECKED BY R. D. Frymire	
TASK DESCRIPTION	QUANTITY		MH	TOTAL HRS	LABOR		EQUIPMENT		MATERIAL		TOTAL	SHIPPING			
	NO. OF UNITS	UNIT MEAS			UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST		UNIT WT	TOTAL WT		
SECOND FLOOR CHAPEL WINDOWS															
REMOVE EXISTING															
6'-6" H X 20'-0" L															
SECTION OF ALUM															
WINDOWS	130	SF	-	-	.93	121	-	-	-	-	121				
INSTALL NEW BRONZE															
TINTED WINDOWS/W															
THERMAL BREAK &															
1-INCH INSULATING															
GLASS	130	SF	-	-	4.81	625	-	-	25.2	3276	3901				
CAULK NEW WINDOWS	100	LF	-	-	1.01	101	-	-	0.18	18	119				
TOTAL THIS SHEET											4141				

COST ESTIMATE ANALYSIS										INVOICATION/CONTRACTOR		EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 5-900-2; the proponent agency is USACE.												January 1992		April 1992	
PROJECT Irwin Army Community Hospital - EEAP										CODE (Check one) <input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C		DRAWING NO.		SHEET 4 OF 5 SHEETS	
LOCATION Fort Riley, Kansas										<input type="checkbox"/> OTHER		ESTIMATOR		CHECKED BY R. D. Frymire	
TASK DESCRIPTION	QUANTITY		MH	LABOR		EQUIPMENT		MATERIAL		TOTAL	SHIPPING				
	NO. OF UNITS	UNIT MEAS		TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT WT		TOTAL WT				
DINING ROOM WINDOWS															
REMOVE EXISTING															
8'-9" H x 19'-6" L FPD															
STEEL FRAME WINDOWS 12 EA				25						300					
INSTALL NEW BRONZE															
WINDOW UNITS W/															
THERMAL BREAK &															
1-INCH TINTED															
INSULATING GLASS 12 EA				39	468		250	3000	3468						
CAULK NEW WINDOWS 200 LF				1.01	202		0.18	36	238						
TOTAL THIS SHEET										4006					

TRACE 600 PROGRAM WAS USED TO MODEL THE NURSE QUARTERS. THE BUILDING ENVELOPE INPUT WAS CHANGED TO REFLECT THE REPLACEMENT OF 238 WINDOW UNITS WITH 2-INCH THICK PORCELEAN FINISHED INSULATING PANELS AND 101 WINDOW UNITS WITH BRONZE TINTED DOUBLE HUNG ALUMINUM WINDOWS WITH THERMAL BREAK AND 1-INCH INSULATING GLASS. ELECTRICAL ENERGY AND GAS CONSUMPTION FOR THE BUILDING ARE REDUCED DUE TO THIS MODIFICATION.

ASSUMED CONDITIONS

DISTRICT PIPING LOSSES = 10%

HEAT EXCHANGER EFFICIENCY = 80%

GAS COST = \$ 3.7/MCF

ELECT COST = \$ 0.038/KWH

MAINTENANCE COST DIFFERENCE WAS BASED ON AREA OF WINDOW TO BE WASHED.

ANNUAL NONRECURRING COST FOR WINDOW REPLACEMENT DUE TO BREAKAGE WAS DETERMINED TO BE THE SAME FOR BOTH WINDOW SYSTEMS. WINDOW CAULKING WAS BASED ON 25 YEAR LIFE.

WINDOW "U" = 0.57, S.C. = 0.36

DIFFERENCE IN ENERGY CONSUMPTION

BASE RUN T0015080 ALT 1 ANNUAL KWH = 451,097

NEK WINDOWS T0015080 ALT 2 ANNUAL KWH = 311,580

139,517

BASE RUN ANNUAL MCF = $622.99 \times 1.1 \div 0.8 = 856.61$

T0015080 ALT 2 MCF = $319.01 \times 1.1 \div 0.8 = 438.61$

417.91

ANNUAL ENERGY SAVINGS

$$\begin{aligned} 139,517 \text{ KWH} \times 3413 \text{ BTU/KWH} &= 476.17 \times 10^6 \\ 417.97 \text{ MCF} \times 1.031 \times 10^6 \text{ BTU/MCF} &= \underline{430.93 \times 10^6} \\ &907.10 \times 10^6 \text{ BTU/YR} \end{aligned}$$

ANNUAL DOLLAR SAVINGS

$$\begin{aligned} 139,517 \text{ KWH} \times \$0.038/\text{KWH} &= \$5301.65 \\ 417.97 \text{ MCF} \times \$3.70/\text{MCF} &= \underline{\$1546.50} \\ &\$6848.15/\text{YR} \end{aligned}$$

ANNUAL RECURRING MAINTENANCE FOR WINDOW WASHING

EXISTING WINDOWS:

$$5085 \text{ SF} \div 400 \text{ SF/MHR} \times \$17.50/\text{MHR} \times 2 = \$445/\text{YR}$$

NEW WINDOWS:

$$1515 \text{ SF} \div 400 \text{ SF/MHR} \times \$17.50/\text{MHR} \times 2 = \underline{\$133/\text{YR}}$$

$$\text{SAVINGS} = \$312/\text{YR}$$

NONRECURRING MAINTENANCE FOR WINDOW CAULKING

EXISTING WINDOW SYSTEM WILL REQUIRE CAULKING REPLACEMENT IN YEAR 21 OF THE 25 YEAR STUDY LIFE ASSUMING 25 YEAR CAULK. COST OF WINDOW CAULKING AS INDICATED IN COST ESTIMATE: $4000 \text{ LF} \times \$1.19/\text{LF} = \4760.00

MONTHLY ENERGY CONSUMPTION - ALTERNATIVE 1
EXISTING EQUIPMENT

----- MONTHLY ENERGY CONSUMPTION -----

Month	ELEC	DEMAND	STEAM
	On Peak (kWh)	On Peak (kW)	
Jan	28,898	42	2,558
Feb	26,057	42	1,583
March	28,578	42	501
April	27,513	42	90
May	37,489	126	0
June	50,292	162	0
July	65,793	187	0
Aug	60,238	179	0
Sept	41,238	141	0
Oct	28,454	42	65
Nov	27,775	42	584
Dec	28,775	42	1,041
Total	451,097	187	6,423

Building Energy Consumption = 84,394 (Btu/Sq Ft/Year)
Source Energy Consumption = 211,792 (Btu/Sq Ft/Year)

Floor Area = 25,854 (Sq Ft)

Date: January

TOTAL ENERGY - KWH 28,898

BILLING CAPACITY - KVA 42

CAPACITY CHARGE

(200) First	42 KVA of Billing Capacity @ \$4.45 =	\$186.90
(400) Next	0 KVA of Billing Capacity @ \$4.25 =	\$0.00
Additional	0 KVA of Billing Capacity @ \$4.05 =	\$0.00

TOTAL KVA 42 \$186.90

Ownership (Y/N)? Y Less Substation Ownership Discount @ \$.20/KVA = (\$8.40)

\$178.50

ENERGY CHARGE

50 x	42 =	2,100 KWH @ 0.03726 =	\$78.25
100 x	42 =	4,200 KWH @ 0.03206 =	\$134.65
250 x	42 =	10,500 KWH @ 0.02886 =	\$303.03
EXCESS	=	12,098 KWH @ 0.02666 =	\$322.53

TOTAL KVA 28,898 \$838.46

Capacity Charge \$178.50

Energy Charge \$838.46

Total Capacity
and Energy -----
\$1,016.96

Subtotal \$0.00

City Revenue Charge \$0.00

Subtotal \$0.00

KRST Exempt 100.00% \$0.00

LRST Exempt 100.00% \$0.00

Subtotal \$0.00

Other Charges \$0.00

TOTAL AMOUNT DUE \$1,016.96

Date: February

TOTAL ENERGY - KWH 26,057

BILLING CAPACITY - KVA 42

CAPACITY CHARGE

(200) First	42 KVA of Billing Capacity @ \$4.45 =	\$186.90
(400) Next	0 KVA of Billing Capacity @ \$4.25 =	\$0.00
Additional	0 KVA of Billing Capacity @ \$4.05 =	\$0.00

TOTAL KVA 42 \$186.90

Ownership (Y/N)? Y Less Substation Ownership Discount @ \$.20/KVA = (\$8.40)

\$178.50

ENERGY CHARGE

50 x	42 =	2,100 KWH @ 0.03726 =	\$78.25
100 x	42 =	4,200 KWH @ 0.03206 =	\$134.65
250 x	42 =	10,500 KWH @ 0.02886 =	\$303.03
EXCESS	=	9,257 KWH @ 0.02666 =	\$246.79

TOTAL KVA 26,057 \$762.72

Capacity Charge \$178.50
Energy Charge \$762.72
Total Capacity
and Energy -----
\$941.22

Subtotal \$0.00
City Revenue Charge \$0.00

Subtotal \$0.00
KRST Exempt 100.00% \$0.00
LRST Exempt 100.00% \$0.00

Subtotal \$0.00
Other Charges \$0.00

TOTAL AMOUNT DUE \$941.22

Date: March

TOTAL ENERGY - KWH 28,578

BILLING CAPACITY - KVA 42

CAPACITY CHARGE

(200) First	42 KVA of Billing Capacity @ \$4.45 =	\$186.90
(400) Next	0 KVA of Billing Capacity @ \$4.25 =	\$0.00
Additional	0 KVA of Billing Capacity @ \$4.05 =	\$0.00

TOTAL KVA 42 \$186.90

Ownership (Y/N)? Y Less Substation Ownership Discount @ \$.20/KVA = (\$8.40)

\$178.50

ENERGY CHARGE

50 x 42 = 2,100 KWH @ 0.03726 = \$78.25
100 x 42 = 4,200 KWH @ 0.03206 = \$134.65
250 x 42 = 10,500 KWH @ 0.02886 = \$303.03
EXCESS = 11,778 KWH @ 0.02666 = \$314.00

TOTAL KVA 28,578 \$829.93

Capacity Charge \$178.50
Energy Charge \$829.93
Total Capacity
and Energy -----
\$1,008.43

Subtotal \$0.00
City Revenue Charge \$0.00

Subtotal \$0.00
KRST Exempt 100.00% \$0.00
LRST Exempt 100.00% \$0.00

Subtotal \$0.00
Other Charges \$0.00

TOTAL AMOUNT DUE \$1,008.43

Date: April

TOTAL ENERGY - KWH 27,513

BILLING CAPACITY - KVA 42

CAPACITY CHARGE

(200) First	42 KVA of Billing Capacity @ \$4.45 =	\$186.90
(400) Next	0 KVA of Billing Capacity @ \$4.25 =	\$0.00
Additional	0 KVA of Billing Capacity @ \$4.05 =	\$0.00

TOTAL KVA 42 \$186.90

Ownership (Y/N)? Y Less Substation Ownership Discount @ \$.20/KVA = (\$8.40)

\$178.50

ENERGY CHARGE

50 x 42 = 2,100 KWH @ 0.03726 = \$78.25
100 x 42 = 4,200 KWH @ 0.03206 = \$134.65
250 x 42 = 10,500 KWH @ 0.02886 = \$303.03
EXCESS = 10,713 KWH @ 0.02666 = \$285.61

TOTAL KVA 27,513 \$801.54

Capacity Charge \$178.50
Energy Charge \$801.54
Total Capacity
and Energy -----
\$980.04

Subtotal \$0.00
City Revenue Charge \$0.00

Subtotal \$0.00
KRST Exempt 100.00% \$0.00
LRST Exempt 100.00% \$0.00

Subtotal \$0.00
Other Charges \$0.00

TOTAL AMOUNT DUE \$980.04

Date: May

TOTAL ENERGY - KWH 37,489

BILLING CAPACITY - KVA 126

CAPACITY CHARGE

(200) First	126 KVA of Billing Capacity @ \$4.45 =	\$560.70
(400) Next	0 KVA of Billing Capacity @ \$4.25 =	\$0.00
Additional	0 KVA of Billing Capacity @ \$4.05 =	\$0.00

TOTAL KVA 126 \$560.70

Ownership (Y/N)? Y Less Substation Ownership Discount @ \$.20/KVA = (\$25.20)

\$535.50

ENERGY CHARGE

50 x	126 =	6,300 KWH @ 0.03726 =	\$234.74
100 x	126 =	12,600 KWH @ 0.03206 =	\$403.96
250 x	=	18,589 KWH @ 0.02886 =	\$536.48
EXCESS	=	0 KWH @ 0.02666 =	\$0.00

TOTAL KVA 37,489 \$1,175.17

Capacity Charge \$535.50

Energy Charge \$1,175.17

Total Capacity
and Energy \$1,710.67

Subtotal \$0.00

City Revenue Charge \$0.00

Subtotal \$0.00

KRST Exempt 100.00% \$0.00

LRST Exempt 100.00% \$0.00

Subtotal \$0.00

Other Charges \$0.00

TOTAL AMOUNT DUE \$1,710.67

Date: June

TOTAL ENERGY - KWH 50,292

BILLING CAPACITY - KVA 162

CAPACITY CHARGE

(200) First	162 KVA of Billing Capacity @ \$4.45 =	\$720.90
(400) Next	0 KVA of Billing Capacity @ \$4.25 =	\$0.00
Additional	0 KVA of Billing Capacity @ \$4.05 =	\$0.00

TOTAL KVA 162 \$720.90

Ownership (Y/N)? Y Less Substation Ownership Discount @ \$.20/KVA = (\$32.40)

\$688.50

ENERGY CHARGE

50 x	162 =	8,100 KWH @ 0.03726 =	\$301.81
100 x	162 =	16,200 KWH @ 0.03206 =	\$519.37
250 x	=	25,992 KWH @ 0.02886 =	\$750.13
EXCESS	=	0 KWH @ 0.02666 =	\$0.00

TOTAL KVA 50,292 \$1,571.31

Capacity Charge \$688.50
Energy Charge \$1,571.31
Total Capacity
and Energy -----
\$2,259.81

Subtotal \$0.00
City Revenue Charge \$0.00

Subtotal \$0.00
KRST Exempt 100.00% \$0.00
LRST Exempt 100.00% \$0.00

Subtotal \$0.00
Other Charges \$0.00

TOTAL AMOUNT DUE \$2,259.81

Date: July

TOTAL ENERGY - KWH 65,793

BILLING CAPACITY - KVA 187

CAPACITY CHARGE

(200) First	187 KVA of Billing Capacity @ \$4.45 =	\$832.15
(400) Next	0 KVA of Billing Capacity @ \$4.25 =	\$0.00
Additional	0 KVA of Billing Capacity @ \$4.05 =	\$0.00

TOTAL KVA 187 \$832.15

Ownership (Y/N)? Y Less Substation Ownership Discount @ \$.20/KVA = (\$37.40)

\$794.75

ENERGY CHARGE

50 x	187 =	9,350 KWH @ 0.03726 =	\$348.38
100 x	187 =	18,700 KWH @ 0.03206 =	\$599.52
250 x	=	37,743 KWH @ 0.02886 =	\$1,089.26
EXCESS	=	0 KWH @ 0.02666 =	\$0.00

TOTAL KVA 65,793 \$2,037.17

Capacity Charge \$794.75

Energy Charge \$2,037.17

Total Capacity
and Energy \$2,831.92

Subtotal \$0.00
City Revenue Charge \$0.00

Subtotal \$0.00
KRST Exempt 100.00% \$0.00
LRST Exempt 100.00% \$0.00

Subtotal \$0.00
Other Charges \$0.00

TOTAL AMOUNT DUE \$2,831.92

Date: August

TOTAL ENERGY - KWH 60,238

BILLING CAPACITY - KVA 179

CAPACITY CHARGE

(200) First	179 KVA of Billing Capacity @ \$4.45 =	\$796.55
(400) Next	0 KVA of Billing Capacity @ \$4.25 =	\$0.00
Additional	0 KVA of Billing Capacity @ \$4.05 =	\$0.00

TOTAL KVA 179 \$796.55

Ownership (Y/N)? Y Less Substation Ownership Discount @ \$.20/KVA = (\$35.80)

\$760.75

ENERGY CHARGE

50 x	179 =	8,950 KWH @ 0.03726 =	\$333.48
100 x	179 =	17,900 KWH @ 0.03206 =	\$573.87
250 x	=	33,388 KWH @ 0.02886 =	\$963.58
EXCESS	=	0 KWH @ 0.02666 =	\$0.00

TOTAL KVA 60,238 \$1,870.93

Capacity Charge \$760.75

Energy Charge \$1,870.93

Total Capacity
and Energy -----
\$2,631.68

Subtotal \$0.00

City Revenue Charge \$0.00

Subtotal \$0.00

KRST Exempt 100.00% \$0.00

LRST Exempt 100.00% \$0.00

Subtotal \$0.00

Other Charges \$0.00

TOTAL AMOUNT DUE \$2,631.68

Date: September

TOTAL ENERGY - KWH 41,238

BILLING CAPACITY - KVA 141

CAPACITY CHARGE

(200) First	141 KVA of Billing Capacity @ \$4.45 =	\$627.45
(400) Next	0 KVA of Billing Capacity @ \$4.25 =	\$0.00
Additional	0 KVA of Billing Capacity @ \$4.05 =	\$0.00

TOTAL KVA 141 \$627.45

Ownership (Y/N)? Y Less Substation Ownership Discount @ \$.20/KVA = (\$28.20)

\$599.25

ENERGY CHARGE

50 x	141 =	7,050 KWH @ 0.03726 =	\$262.68
100 x	141 =	14,100 KWH @ 0.03206 =	\$452.05
250 x	=	20,088 KWH @ 0.02886 =	\$579.74
EXCESS	=	0 KWH @ 0.02666 =	\$0.00

TOTAL KVA 41,238 \$1,294.47

Capacity Charge \$599.25

Energy Charge \$1,294.47

Total Capacity
and Energy \$1,893.72

Subtotal \$0.00

City Revenue Charge \$0.00

Subtotal \$0.00

KRST Exempt 100.00% \$0.00

LRST Exempt 100.00% \$0.00

Subtotal \$0.00

Other Charges \$0.00

TOTAL AMOUNT DUE \$1,893.72

Date: October

TOTAL ENERGY - KWH 28,454

BILLING CAPACITY - KVA 42

CAPACITY CHARGE

(200) First	42 KVA of Billing Capacity @ \$4.45 =	\$186.90
(400) Next	0 KVA of Billing Capacity @ \$4.25 =	\$0.00
Additional	0 KVA of Billing Capacity @ \$4.05 =	\$0.00

TOTAL KVA 42 \$186.90

Ownership (Y/N)? Y Less Substation Ownership Discount @ \$.20/KVA = (\$8.40)

\$178.50

ENERGY CHARGE

50 x	42 =	2,100 KWH @ 0.03726 =	\$78.25
100 x	42 =	4,200 KWH @ 0.03206 =	\$134.65
250 x	42 =	10,500 KWH @ 0.02886 =	\$303.03
EXCESS	=	11,654 KWH @ 0.02666 =	\$310.70

TOTAL KVA 28,454 \$826.62

Capacity Charge \$178.50

Energy Charge \$826.62

Total Capacity
and Energy -----
\$1,005.12

Subtotal \$0.00

City Revenue Charge \$0.00

Subtotal \$0.00

KRST Exempt 100.00% \$0.00

LRST Exempt 100.00% \$0.00

Subtotal \$0.00

Other Charges \$0.00

TOTAL AMOUNT DUE \$1,005.12

Date: November

TOTAL ENERGY - KWH 27,775

BILLING CAPACITY - KVA 42

CAPACITY CHARGE

(200) First	42 KVA of Billing Capacity @ \$4.45 =	\$186.90
(400) Next	0 KVA of Billing Capacity @ \$4.25 =	\$0.00
Additional	0 KVA of Billing Capacity @ \$4.05 =	\$0.00

TOTAL KVA 42 \$186.90

Ownership (Y/N)? Y Less Substation Ownership Discount @ \$.20/KVA = (\$8.40)

\$178.50

ENERGY CHARGE

50 x	42 =	2,100 KWH @ 0.03726 =	\$78.25
100 x	42 =	4,200 KWH @ 0.03206 =	\$134.65
250 x	42 =	10,500 KWH @ 0.02886 =	\$303.03
EXCESS	=	10,975 KWH @ 0.02666 =	\$292.59

TOTAL KVA 27,775 \$808.52

Capacity Charge \$178.50
Energy Charge \$808.52
Total Capacity
and Energy -----
\$987.02

Subtotal \$0.00
City Revenue Charge \$0.00

Subtotal \$0.00
KRST Exempt 100.00% \$0.00
LRST Exempt 100.00% \$0.00

Subtotal \$0.00
Other Charges \$0.00

TOTAL AMOUNT DUE \$987.02

Date: December

TOTAL ENERGY - KWH 28,775

BILLING CAPACITY - KVA 42

CAPACITY CHARGE

(200) First	42 KVA of Billing Capacity @ \$4.45 =	\$186.90
(400) Next	0 KVA of Billing Capacity @ \$4.25 =	\$0.00
Additional	0 KVA of Billing Capacity @ \$4.05 =	\$0.00

TOTAL KVA 42 \$186.90

Ownership (Y/N)? Y Less Substation Ownership Discount @ \$.20/KVA = (\$8.40)

\$178.50

ENERGY CHARGE

50 x	42 =	2,100 KWH @ 0.03726 =	\$78.25
100 x	42 =	4,200 KWH @ 0.03206 =	\$134.65
250 x	42 =	10,500 KWH @ 0.02886 =	\$303.03
EXCESS	=	11,975 KWH @ 0.02666 =	\$319.25

TOTAL KVA 28,775 \$835.18

Capacity Charge \$178.50
Energy Charge \$835.18
Total Capacity
and Energy \$1,013.68

Subtotal \$0.00
City Revenue Charge \$0.00

Subtotal \$0.00
KRST Exempt 100.00% \$0.00
LRST Exempt 100.00% \$0.00

Subtotal \$0.00
Other Charges \$0.00

TOTAL AMOUNT DUE \$1,013.68

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Trane Air Conditioning Economics
By: MASSAGLIA-NEUSTROM-BREDSON

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MONTHLY ENERGY CONSUMPTION - ALTERNATIVE 2
ECO 29 REDUCE WINDOW AREA

----- MONTHLY ENERGY CONSUMPTION -----

Month	ELEC	DEMAND	STEAM
	On Peak (kwh)	On Peak (kW)	
Jan	21,446	32	1,436
Feb	19,370	32	897
March	21,206	32	181
April	20,243	32	13
May	25,151	67	0
June	32,977	85	0
July	41,782	95	0
Aug	38,848	93	0
Sept	27,673	76	0
Oct	20,894	32	6
Nov	20,591	32	263
Dec	21,398	32	493
Total	311,580	95	3,289

Building Energy Consumption = 53,853 (Btu/Sq Ft/Year)
Source Energy Consumption = 140,369 (Btu/Sq Ft/Year)

Floor Area = 25,854 (Sq Ft)

Date: January

TOTAL ENERGY - KWH 21,446

BILLING CAPACITY - KVA 32

CAPACITY CHARGE

(200) First	32 KVA of Billing Capacity @ \$4.45 =	\$142.40
(400) Next	0 KVA of Billing Capacity @ \$4.25 =	\$0.00
Additional	0 KVA of Billing Capacity @ \$4.05 =	\$0.00

TOTAL KVA 32 \$142.40

Ownership (Y/N)? Y Less Substation Ownership Discount @ \$.20/KVA = (\$6.40)

\$136.00

ENERGY CHARGE

50 x	32 =	1,600 KWH @ 0.03726 =	\$59.62
100 x	32 =	3,200 KWH @ 0.03206 =	\$102.59
250 x	32 =	8,000 KWH @ 0.02886 =	\$230.88
EXCESS	=	8,646 KWH @ 0.02666 =	\$230.50

TOTAL KVA 21,446 \$623.59

Capacity Charge \$136.00
Energy Charge \$623.59
Total Capacity
and Energy \$759.59

Subtotal \$0.00
City Revenue Charge \$0.00

Subtotal \$0.00
KRST Exempt 100.00% \$0.00
LRST Exempt 100.00% \$0.00

Subtotal \$0.00
Other Charges \$0.00

TOTAL AMOUNT DUE \$759.59

Date: February

TOTAL ENERGY - KWH 19,370

BILLING CAPACITY - KVA 32

CAPACITY CHARGE

(200) First	32 KVA of Billing Capacity @ \$4.45 =	\$142.40
(400) Next	0 KVA of Billing Capacity @ \$4.25 =	\$0.00
Additional	0 KVA of Billing Capacity @ \$4.05 =	\$0.00

TOTAL KVA 32 \$142.40

Ownership (Y/N)? Y Less Substation Ownership Discount @ \$.20/KVA = (\$6.40)

\$136.00

ENERGY CHARGE

50 x	32 =	1,600 KWH @ 0.03726 =	\$59.62
100 x	32 =	3,200 KWH @ 0.03206 =	\$102.59
250 x	32 =	8,000 KWH @ 0.02886 =	\$230.88
EXCESS	=	6,570 KWH @ 0.02666 =	\$175.16

TOTAL KVA 19,370 \$568.24

Capacity Charge \$136.00
Energy Charge \$568.24
Total Capacity
and Energy -----
\$704.24

Subtotal \$0.00
City Revenue Charge \$0.00

Subtotal \$0.00
KRST Exempt 100.00% \$0.00
LRST Exempt 100.00% \$0.00

Subtotal \$0.00
Other Charges \$0.00

TOTAL AMOUNT DUE \$704.24

Date: March

TOTAL ENERGY - KWH 21,206

BILLING CAPACITY - KVA 32

CAPACITY CHARGE

(200) First	32 KVA of Billing Capacity @ \$4.45 =	\$142.40
(400) Next	0 KVA of Billing Capacity @ \$4.25 =	\$0.00
Additional	0 KVA of Billing Capacity @ \$4.05 =	\$0.00

TOTAL KVA 32 \$142.40

Ownership (Y/N)? Y Less Substation Ownership Discount @ \$.20/KVA = (\$6.40)

\$136.00

ENERGY CHARGE

50 x	32 =	1,600 KWH @ 0.03726 =	\$59.62
100 x	32 =	3,200 KWH @ 0.03206 =	\$102.59
250 x	32 =	8,000 KWH @ 0.02886 =	\$230.88
EXCESS	=	8,406 KWH @ 0.02666 =	\$224.10

TOTAL KVA 21,206 \$617.19

Capacity Charge \$136.00

Energy Charge \$617.19

Total Capacity
and Energy -----
\$753.19

Subtotal \$0.00

City Revenue Charge \$0.00

Subtotal \$0.00

KRST Exempt 100.00% \$0.00

LRST Exempt 100.00% \$0.00

Subtotal \$0.00

Other Charges \$0.00

TOTAL AMOUNT DUE \$753.19

Date: April

TOTAL ENERGY - KWH 20,243

BILLING CAPACITY - KVA 32

CAPACITY CHARGE

(200) First	32 KVA of Billing Capacity @ \$4.45 =	\$142.40
(400) Next	0 KVA of Billing Capacity @ \$4.25 =	\$0.00
Additional	0 KVA of Billing Capacity @ \$4.05 =	\$0.00

TOTAL KVA 32 \$142.40

Ownership (Y/N)? Y Less Substation Ownership Discount @ \$.20/KVA = (\$6.40)

\$136.00

ENERGY CHARGE

50 x	32 =	1,600 KWH @ 0.03726 =	\$59.62
100 x	32 =	3,200 KWH @ 0.03206 =	\$102.59
250 x	32 =	8,000 KWH @ 0.02886 =	\$230.88
EXCESS	=	7,443 KWH @ 0.02666 =	\$198.43

TOTAL KVA 20,243 \$591.52

Capacity Charge \$136.00
Energy Charge \$591.52
Total Capacity
and Energy \$727.52

Subtotal \$0.00
City Revenue Charge \$0.00

Subtotal \$0.00
KRST Exempt 100.00% \$0.00
LRST Exempt 100.00% \$0.00

Subtotal \$0.00
Other Charges \$0.00

TOTAL AMOUNT DUE \$727.52

Date: May

TOTAL ENERGY - KWH 25,151

BILLING CAPACITY - KVA 67

CAPACITY CHARGE

(200) First	67 KVA of Billing Capacity @ \$4.45 =	\$298.15
(400) Next	0 KVA of Billing Capacity @ \$4.25 =	\$0.00
Additional	0 KVA of Billing Capacity @ \$4.05 =	\$0.00

TOTAL KVA 67 \$298.15

Ownership (Y/N)? Y Less Substation Ownership Discount @ \$.20/KVA = (\$13.40)

\$284.75

ENERGY CHARGE

50 x	67 =	3,350 KWH @ 0.03726 =	\$124.82
100 x	67 =	6,700 KWH @ 0.03206 =	\$214.80
250 x	=	15,101 KWH @ 0.02886 =	\$435.81
EXCESS	=	0 KWH @ 0.02666 =	\$0.00

TOTAL KVA 25,151 \$775.44

Capacity Charge \$284.75

Energy Charge \$775.44

Total Capacity
and Energy -----
\$1,060.19

Subtotal \$0.00

City Revenue Charge \$0.00

Subtotal \$0.00

KRST Exempt 100.00% \$0.00

LRST Exempt 100.00% \$0.00

Subtotal \$0.00

Other Charges \$0.00

TOTAL AMOUNT DUE \$1,060.19

Date: June

TOTAL ENERGY - KWH 32,977

BILLING CAPACITY - KVA 85

CAPACITY CHARGE

(200) First	85 KVA of Billing Capacity @ \$4.45 =	\$378.25
(400) Next	0 KVA of Billing Capacity @ \$4.25 =	\$0.00
Additional	0 KVA of Billing Capacity @ \$4.05 =	\$0.00

TOTAL KVA 85 \$378.25

Ownership (Y/N)? Y Less Substation Ownership Discount @ \$.20/KVA = (\$17.00)

\$361.25

ENERGY CHARGE

50 x	85 =	4,250 KWH @ 0.03726 =	\$158.36
100 x	85 =	8,500 KWH @ 0.03206 =	\$272.51
250 x	=	20,227 KWH @ 0.02886 =	\$583.75
EXCESS	=	0 KWH @ 0.02666 =	\$0.00

TOTAL KVA 32,977 \$1,014.62

Capacity Charge \$361.25
Energy Charge \$1,014.62
Total Capacity
and Energy \$1,375.87

Subtotal \$0.00
City Revenue Charge \$0.00

Subtotal \$0.00
KRST Exempt 100.00% \$0.00
LRST Exempt 100.00% \$0.00

Subtotal \$0.00
Other Charges \$0.00

TOTAL AMOUNT DUE \$1,375.87

Date: July

TOTAL ENERGY - KWH 41,782

BILLING CAPACITY - KVA 95

CAPACITY CHARGE

(200) First	95 KVA of Billing Capacity @ \$4.45 =	\$422.75
(400) Next	0 KVA of Billing Capacity @ \$4.25 =	\$0.00
Additional	0 KVA of Billing Capacity @ \$4.05 =	\$0.00

TOTAL KVA 95 \$422.75

Ownership (Y/N)? Y Less Substation Ownership Discount @ \$.20/KVA = (\$19.00)

\$403.75

ENERGY CHARGE

50 x	95 =	4,750 KWH @ 0.03726 =	\$176.99
100 x	95 =	9,500 KWH @ 0.03206 =	\$304.57
250 x	95 =	23,750 KWH @ 0.02886 =	\$685.43
EXCESS	=	3,782 KWH @ 0.02666 =	\$100.83

TOTAL KVA 41,782 \$1,267.81

Capacity Charge \$403.75

Energy Charge \$1,267.81

Total Capacity
and Energy -----
\$1,671.56

Subtotal \$0.00

City Revenue Charge \$0.00

Subtotal \$0.00

KRST Exempt 100.00% \$0.00

LRST Exempt 100.00% \$0.00

Subtotal \$0.00

Other Charges \$0.00

TOTAL AMOUNT DUE \$1,671.56

Date: August

TOTAL ENERGY - KWH 38,848

BILLING CAPACITY - KVA 93

CAPACITY CHARGE

(200) First	93 KVA of Billing Capacity @ \$4.45 =	\$413.85
(400) Next	0 KVA of Billing Capacity @ \$4.25 =	\$0.00
Additional	0 KVA of Billing Capacity @ \$4.05 =	\$0.00

TOTAL KVA 93 \$413.85

Ownership (Y/N)? Y Less Substation Ownership Discount @ \$.20/KVA = (\$18.60)

\$395.25

ENERGY CHARGE

50 x	93 =	4,650 KWH @ 0.03726 =	\$173.26
100 x	93 =	9,300 KWH @ 0.03206 =	\$298.16
250 x	93 =	23,250 KWH @ 0.02886 =	\$671.00
EXCESS	=	1,648 KWH @ 0.02666 =	\$43.94

TOTAL KVA 38,848 \$1,186.35

Capacity Charge \$395.25
Energy Charge \$1,186.35
Total Capacity
and Energy -----
\$1,581.60

Subtotal \$0.00
City Revenue Charge \$0.00

Subtotal \$0.00
KRST Exempt 100.00% \$0.00
LRST Exempt 100.00% \$0.00

Subtotal \$0.00
Other Charges \$0.00

TOTAL AMOUNT DUE \$1,581.60

Date: September

TOTAL ENERGY - KWH 27,673

BILLING CAPACITY - KVA 76

CAPACITY CHARGE

(200) First	76 KVA of Billing Capacity @ \$4.45 =	\$338.20
(400) Next	0 KVA of Billing Capacity @ \$4.25 =	\$0.00
Additional	0 KVA of Billing Capacity @ \$4.05 =	\$0.00

TOTAL KVA 76 \$338.20

Ownership (Y/N)? Y Less Substation Ownership Discount @ \$.20/KVA = (\$15.20)

\$323.00

ENERGY CHARGE

50 x	76 =	3,800 KWH @ 0.03726 =	\$141.59
100 x	76 =	7,600 KWH @ 0.03206 =	\$243.66
250 x	=	16,273 KWH @ 0.02886 =	\$469.64
EXCESS	=	0 KWH @ 0.02666 =	\$0.00

TOTAL KVA 27,673 \$854.88

Capacity Charge \$323.00

Energy Charge \$854.88

Total Capacity
and Energy -----
\$1,177.88

Subtotal \$0.00

City Revenue Charge \$0.00

Subtotal \$0.00

KRST Exempt 100.00% \$0.00

LRST Exempt 100.00% \$0.00

Subtotal \$0.00

Other Charges \$0.00

TOTAL AMOUNT DUE \$1,177.88

Date: October

TOTAL ENERGY - KWH 20,894

BILLING CAPACITY - KVA 32

CAPACITY CHARGE

(200) First	32 KVA of Billing Capacity @ \$4.45 =	\$142.40
(400) Next	0 KVA of Billing Capacity @ \$4.25 =	\$0.00
Additional	0 KVA of Billing Capacity @ \$4.05 =	\$0.00

TOTAL KVA 32 \$142.40

Ownership (Y/N)? Y Less Substation Ownership Discount @ \$.20/KVA = (\$6.40)

\$136.00

ENERGY CHARGE

50 x 32 = 1,600 KWH @ 0.03726 = \$59.62
100 x 32 = 3,200 KWH @ 0.03206 = \$102.59
250 x 32 = 8,000 KWH @ 0.02886 = \$230.88
EXCESS = 8,094 KWH @ 0.02666 = \$215.79

TOTAL KVA 20,894 \$608.87

Capacity Charge \$136.00
Energy Charge \$608.87
Total Capacity
and Energy -----
\$744.87

Subtotal \$0.00
City Revenue Charge \$0.00

Subtotal \$0.00
KRST Exempt 100.00% \$0.00
LRST Exempt 100.00% \$0.00

Subtotal \$0.00
Other Charges \$0.00

TOTAL AMOUNT DUE \$744.87

Date: November

TOTAL ENERGY - KWH 20,591

BILLING CAPACITY - KVA 32

CAPACITY CHARGE

(200) First	32 KVA of Billing Capacity @ \$4.45 =	\$142.40
(400) Next	0 KVA of Billing Capacity @ \$4.25 =	\$0.00
Additional	0 KVA of Billing Capacity @ \$4.05 =	\$0.00

TOTAL KVA 32 \$142.40

Ownership (Y/N)? Y Less Substation Ownership Discount @ \$.20/KVA = (\$6.40)

\$136.00

ENERGY CHARGE

50 x	32 =	1,600 KWH @ 0.03726 =	\$59.62
100 x	32 =	3,200 KWH @ 0.03206 =	\$102.59
250 x	32 =	8,000 KWH @ 0.02886 =	\$230.88
EXCESS	=	7,791 KWH @ 0.02666 =	\$207.71

TOTAL KVA 20,591 \$600.80

Capacity Charge \$136.00
Energy Charge \$600.80
Total Capacity
and Energy -----
\$736.80

Subtotal \$0.00
City Revenue Charge \$0.00

Subtotal \$0.00
KRST Exempt 100.00% \$0.00
LRST Exempt 100.00% \$0.00

Subtotal \$0.00
Other Charges \$0.00

TOTAL AMOUNT DUE \$736.80

Date: December

TOTAL ENERGY - KWH 21,398

BILLING CAPACITY - KVA 32

CAPACITY CHARGE

(200) First	32 KVA of Billing Capacity @ \$4.45 =	\$142.40
(400) Next	0 KVA of Billing Capacity @ \$4.25 =	\$0.00
Additional	0 KVA of Billing Capacity @ \$4.05 =	\$0.00

TOTAL KVA 32 \$142.40

Ownership (Y/N)? Y Less Substation Ownership Discount @ \$.20/KVA = (\$6.40)

\$136.00

ENERGY CHARGE

50 x	32 =	1,600 KWH @ 0.03726 =	\$59.62
100 x	32 =	3,200 KWH @ 0.03206 =	\$102.59
250 x	32 =	8,000 KWH @ 0.02886 =	\$230.88
EXCESS	=	8,598 KWH @ 0.02666 =	\$229.22

TOTAL KVA 21,398 \$622.31

Capacity Charge \$136.00
Energy Charge \$622.31
Total Capacity
and Energy -----
\$758.31

Subtotal \$0.00
City Revenue Charge \$0.00

Subtotal \$0.00
KRST Exempt 100.00% \$0.00
LRST Exempt 100.00% \$0.00

Subtotal \$0.00
Other Charges \$0.00

TOTAL AMOUNT DUE \$758.31

COST ESTIMATE ANALYSIS										EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 5-800-2; the proponent agency is USACE.										January 1992		April 1992	
PROJECT		INVITATION/CONTRACTOR		CODE (Check one)		DRAWING NO.		SHEET 1 OF 3 SHEETS		CHECKED BY		R. D. Frymire	
LOCATION		Fort Riley, Kansas		OTHER		ESTIMATOR		TOTAL		UNIT WT		TOTAL WT	
TASK DESCRIPTION	QUANTITY	NO. OF UNITS	MH	UNIT MEAS	TOTAL HRS	LABOR		EQUIPMENT		MATERIAL		SHIPPING	
						UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	UNIT WT	TOTAL WT
SHEET 2													
SHEET 3													
SUBTOTAL													
CONTRACTOR DH @ 15%													
SUBTOTAL													
CONTRACTOR PROFIT @ 10%													
SUBTOTAL													
CONTINGENCIES @ 5.5%													
CONSTRUCTION COST													
SIOH @ 6.0%													
TOTAL THIS SHEET													

COST ESTIMATE ANALYSIS										INVOITATION/CONTRACTOR		EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 5-800-2; the proponent agency is USACE.												January 1992		April 1992	
PROJECT		Irwin Army Community Hospital - EEAP								CODE (Check one)		DRAWING NO.		SHEET 2 OF 3 SHEETS	
LOCATION		Fort Riley, Kansas								<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C		ESTIMATOR		CHECKED BY	
		QUANTITY		MH		LABOR		EQUIPMENT		MATERIAL		TOTAL		SHIPPING	
TASK DESCRIPTION		NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	UNIT WT	TOTAL WT	
INSULATING GLASS (REPLACE WINDOW UNITS - BUILDING 610)															
REMOVE EXISTING															
SINGLE PANE & D.H.															
ALUM. WINDOW UNITS															
& INTERIOR STORM															
WINDOWS		339	EA	—	15	5085	—	—	—	—	—	—	5085		
INSTALL NEW DOUBLE															
HUNG BRONZE TINTED															
ALUM WINDOW UNITS															
W/THERMAL BREAK,															
1-INCH INSULATING															
GLASS & SCREENS		101	EA	—	39	3939	—	—	200	20,200	24139				
TOTAL THIS SHEET													29,224		

THE EXISTING HOSPITAL ENTRY VESTIBULE DOES NOT HAVE ENOUGH SPACE BETWEEN SETS OF DOORS. THIS CONDITION ALLOWS BOTH SETS OF DOORS TO BE OPEN AT THE SAME TIME. THIS ALLOWS A LARGE AMOUNT OF UNCONDITIONED OUTSIDE AIR INTO THE HOSPITAL LOBBY WHENEVER THE ENTRY IS USED. THE NEW ENTRY VESTIBULE LAYOUT IS LENGTHENED SO THAT BOTH SETS OF DOORS ARE NOT OPEN AT THE SAME TIME. GAS ENERGY WILL BE SAVED BY NOT HEATING THE EXCESS INFILTRATION AIR. ELECTRICAL ENERGY IS SAVED BY NOT COOLING THE EXCESS INFILTRATION AIR. HEATING AND COOLING BINS WERE CALCULATED TO DETERMINE THE AVERAGE OUTSIDE AIR TEMPERATURE DURING THE SUMMER AND WINTER MONTHS.

GAS ENERGY SAVING

INFILTRATION CFM - $7' \times 6'$ DOOR OPENING $\times 0.25 \frac{1}{\text{sqft}} = 10.5 \text{ CFM}$
 FOR EVERY TIME A PERSON ENTERS OR EXITS.

TRAFFIC RATE - 500 TIMES OPEN A DAY

INSIDE DESIGN TEMP = 68°F

HEATING BIN TEMP = 34°F

BIN HOURS = 3941

$$\frac{10.5 \text{ CFM} \times 500 \times 1.08 \times (68 - 34^{\circ}\text{F}) \times 3941 \text{ HRS} \div 0.8 \div 0.78 \times 1.1}{\div 1.031 \times 10^6} = 1299 \text{ MCF}$$

ELECTRICAL ENERGY SAVING

INFILTRATION CFM - 10.5 CFM PER TIME OPENED

TRAFFIC RATE - 500 TIMES OPENED PER DAY

INSIDE DESIGN TEMP = 78°F dB 65°F WB h = 30

COOLING BIN TEMP = 83°F dB 69°F WB h = 33.25

BIN HOURS = 1646

CHILLER KW/TON APPROX 1

$$10.5 \text{ CFM} \times 500 \times 4.5 \times (33.25 - 30) \div 12000 \text{ BTU/H/TON} = 6.4 \text{ TON}$$

$$6.4 \text{ TON} \times 1 \text{ KW/TON} \times 1646 \text{ HRS} = 10,534 \text{ KWH}$$

ANNUAL ENERGY SAVING

$$\begin{array}{l} 10,534 \text{ KWH} \times 3413 \text{ BTU/KWH} \\ 1299 \text{ MCF} \times 1.031 \times 10^6 \text{ BTU/MCF} \end{array}$$

$$\begin{array}{r} = 36 \times 10^6 \\ \underline{1339 \times 10^6} \\ 1375 \times 10^6 \text{ BTU/YR} \end{array}$$

ANNUAL DOLLAR SAVING

$$\begin{array}{l} 10,534 \text{ KWH} \times 0.038 \text{ \$/KWH} \\ 1299 \text{ MCF} \times 3.7 \text{ \$/MCF} \end{array}$$

$$\begin{array}{r} = 400 \\ = \underline{4806} \\ 5,206 \text{ \$/YR} \end{array}$$

HEATING BIN

FOR FORT RILEY, KS OCTOBER TO APRIL, 24 HR/DAY
REFER: TM 5-785

BIN	AVG TEMP °F	HOURS 0-24	°F HOURS
50/54	52	424	22048
45/49	48	473	22704
40/44	42	528	22176
35/39	37	600	22200
30/34	32	595	19040
25/29	27	466	12582
20/24	22	327	7194
15/19	17	223	3791
10/14	12	141	1692
5/9	7	96	672
0/4	2	43	86
-5/-1	-3	21	-63
-10/-6	-8	4	-32
		3,941	134,090

AVERAGE WINTER OUTSIDE AIR TEMPERATURE

$$\frac{134,090^{\circ}\text{F HOURS}}{3,941 \text{ HOURS}} = 34^{\circ}\text{F}$$

COOLING BIN

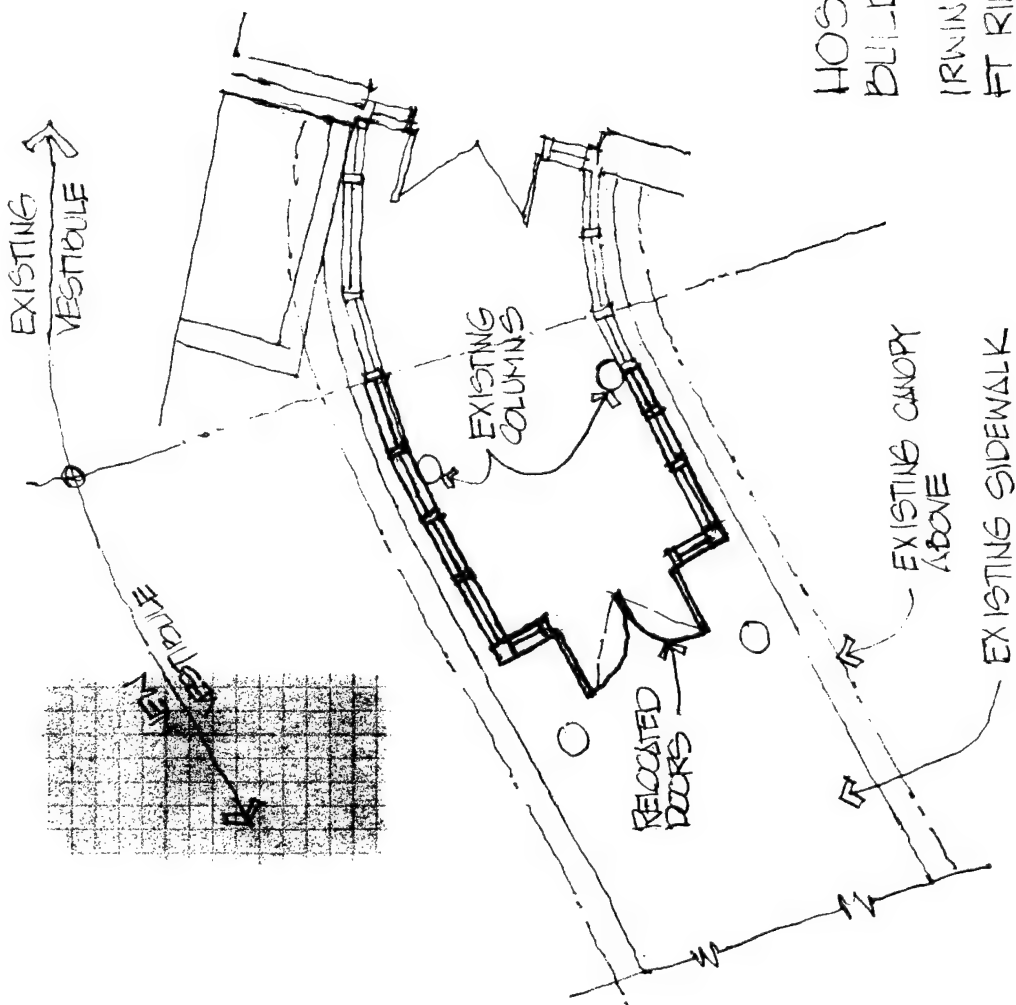
FOR FT. RILEY, KS MAY TO SEPTEMBER, 24 HR/DAY
REFER TM 5-785

BIN	AVG TEMP °F	HOURS 0-24	°F HOURS
75/79	77	587	45199
80/84	82	479	39278
85/89	87	314	27318
90/94	92	181	16652
95/99	97	65	6305
100/104	102	20	2040
		1646	136,792

AVERAGE OUTSIDE AIR TEMPERATURE

$$\frac{136792}{1646} = 83^{\circ}\text{F db}$$

$$\text{MCWB} = 69^{\circ}\text{F}$$



HOSPITAL ENTRY VESTIBULE
 BUILDING NO. 600
 IRWIN ARMY COMMUNITY HOSPITAL
 FT RILEY KANSAS

SCALE: 1/8" = 1'-0"

SCALE: 1/8" = 1'-0"

COST ESTIMATE ANALYSIS										EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 8-800-2; the proponent agency is USACE.										January 1992		April 1992	
PROJECT		INVOITATION/CONTRACTOR		CODE (Check one)		DRAWING NO.		SHEET		OF		SHEETS	
Irwin Army Community Hospital - EEAP		<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C		<input type="checkbox"/> OTHER		ESTIMATOR <i>KB</i>		CHECKED BY R. D. Frymire					
LOCATION		FORT RILEY, KANSAS											
TASK DESCRIPTION	QUANTITY		MH	TOTAL HRS	LABOR		EQUIPMENT		MATERIAL		TOTAL	SHIPPING	
	NO. OF UNITS	UNIT MEAS			UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST		UNIT WT	TOTAL WT
SHEET 3 OF 3 - Sub total											8434		
CONTINGENCIES 5.5%											464		
CONSTRUCTION COST											8898		
STOH 6%											534		
TOTAL THIS SHEET											9432		

COST ESTIMATE ANALYSIS										EFFECTIVE PRICING DATE		DATE PREPARED		
For use of this form, see TM B-800-2; the proponent agency is USACE.										January 1992		April 1992		
PROJECT		INVITATION/CONTRACTOR		CODE (Check one)		DRAWING NO.		SHEET		OF		SHEETS		
Irwin Army Community Hospital - EEAP		Eco 20		<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C		—		2		3				
LOCATION		ESTIMATOR		EQUIPMENT		MATERIAL		CHECKED BY		TOTAL		UNIT WT		
Fort Riley, Kansas		WB		—		—		R. D. Frymire						
TASK DESCRIPTION	QUANTITY			LABOR			EQUIPMENT			MATERIAL			SHIPPING	
	NO. OF UNITS	UNIT MEAS	MH UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	UNIT WT	TOTAL WT		
HOSPITAL ENTRY	1	LS												
RELOCATE, RESET														
ONE PAIR OF EXISTING														
3" x 7" AL ENTRY DRS														
INCL SIDE & TRANSOM														
LIGHTS	1	LS									750			
EXTEND EXISTING														
AL STORE FRONT														
SIDEWALL SYSTEM														
24" x 10" x 10" 1/4	240	SF			2.78	667			12	2880		3547		
PREP EXISTING														
CANOPY SOFFIT AND														
EXPOSED ENDS OF														
EXISTING ALUM														
TOTAL THIS SHEET														

COST ESTIMATE ANALYSIS										EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 8-800-2; the proponent agency is USACE.										January 1992		April 1992	
PROJECT		INVITATION/CONTRACTOR		CODE (Check one)		DRAWING NO.		SHEET		OF		SHEETS	
Irwin Army Community Hospital - EEAP		ECO 20		<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C		—		3		3		3	
LOCATION		ESTIMATOR		OTHER		ESTIMATOR		CHECKED BY		R. D. Frymire			
Fort Riley, Kansas		Bulwinkle 600		<input type="checkbox"/> OTHER		LB							
TASK DESCRIPTION	QUANTITY			LABOR			EQUIPMENT		MATERIAL		TOTAL	SHIPPING	
	NO. OF UNITS	UNIT MEAS	MH	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST		UNIT WT	TOTAL WT
HOSPITAL ENTRY	1	LS											
STREET-RENT - EACH TO													
RECEIVE NEW CONSTR.	1	LS									650.		
MINOR ELECTRICAL													
REVISIONS	1	LS									450.		
											5397		
SUBCONTRACTORS OH	15%										810		
SUBCONTRACTORS PROFIT	10%										540		
											6747		
PRIME CONTRACTORS OH	15%										1012		
PRIME CONTRACTORS PROFIT	10%										675		
Sub total											9434		
TOTAL THIS SHEET													

THE EXISTING EMERGENCY VESTIBULE DOORS ARE SPACED 19'-4" APART. THIS DISTANCE IS MORE THAN ADEQUATE FOR A VESTIBULE BUT DUE TO THE EMERGENCY NATURE OF THE TRAFFIC BOTH SETS OF DOORS WILL BE OPEN AT THE SAME TIME. CURRENTLY THE DOORS ARE BOTH OPEN FOR AN OVERLAPPING PERIOD OF 10 SECONDS. THIS TIME OVERLAP CAN BE REDUCED TO 5 SECONDS BY ADJUSTING THE DOOR HOLD OPEN DEVICES AND EXTENDING THE VESTIBULE BY 5'-0"

GAS ENERGY WILL BE SAVED BY NOT HAVING TO HEAT THE EXCESS INFILTRATION AIR. ELECTRICAL ENERGY IS SAVED BY NOT COOLING EXCESS INFILTRATION AIR. HEATING AND COOLING BINS WERE CALCULATED TO DETERMINE THE AVERAGE OUTSIDE AIR TEMPERATURE DURING THE SUMMER AND WINTER MONTHS.

GAS ENERGY SAVING

INFILTRATION CFM $7' \times 6'$ DOOR OPENING $\times 1$ CFM/40FT = 42 CFM
so for 10 SECONDS 7 CFM
5 SECONDS 3.5 CFM
3.5 CFM SAVED

EVERY TIME A PERSON ENTERS
OR EXITS.

TRAFFIC RATE = 100 TIMES OPEN A DAY

INSIDE DESIGN TEMP = 68°F

HEATING BIN TEMP = 34°F

BIN HOURS = 3941

AIR CONSTANT = 1.08 FOR SENSIBLE HEAT

EFFICIENCIES = PIPING 90% HEAT X-CH 80% BOILER 78%

$$3.5 \text{ CFM} \times 100 \times 1.08 \times (68 - 34^{\circ}\text{F}) \times 3941 \text{ HRS} \div 0.9 \div 0.8 \div 0.78 \div 1.031 \times 10$$
$$= 87 \text{ MCF}$$

ELECTRICAL ENERGY SAVING

INFILTRATION CFM SAVED = 3.5

TRAFFIC RATE = 100 PER DAY

INSIDE DESIGN = $78^{\circ}\text{F}_{\text{db}}$ $65^{\circ}\text{F}_{\text{wb}}$ $h=30$

COOLING BIN TEMP = $83^{\circ}\text{F}_{\text{db}}$ $69^{\circ}\text{F}_{\text{wb}}$ $h=33.25$

BIN HOURS = 1646

CHILLER KW/TON = 1

$$3.5 \text{ CFM} \times 100 \times 4.5 \times (33.25 - 30) \div 12000 \text{ BTU/H/TON} = .43 \text{ TONS}$$

$$.43 \text{ TONS} \times 1 \text{ KW/TON} \times 1646 \text{ HRS} = 708 \text{ KWH}$$

ANNUAL ENERGY SAVING

$$\begin{aligned} &87 \text{ MCF} \times 1.031 \times 10^6 \text{ BTU/MCF} \\ &708 \text{ KWH} \times 3413 \text{ BTU/KWH} \end{aligned}$$

$$\begin{aligned} &= 897 \times 10^6 \\ &= \frac{2.4 \times 10^6}{92.1 \times 10^6 \text{ BTU/YR}} \end{aligned}$$

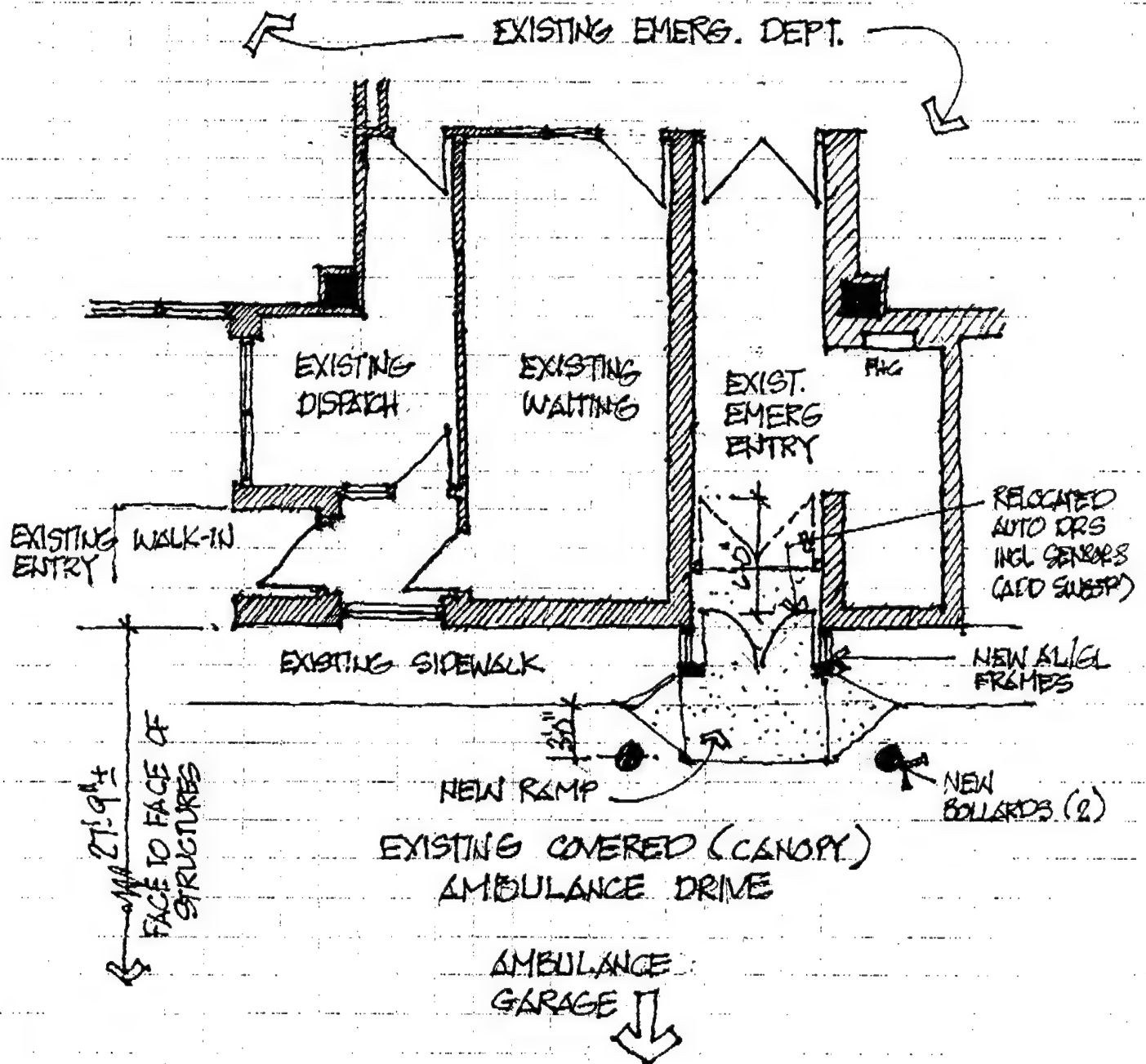
ANNUAL DOLLAR SAVING

$$\begin{aligned} &87 \text{ MCF} \times 3.7 \text{ \$/MCF} \\ &708 \text{ KWH} \times .038 \text{ \$/KWH} \end{aligned}$$

$$\begin{aligned} &= 322 \\ &= \frac{27}{349 \text{ \$/YR}} \end{aligned}$$

COST ESTIMATE ANALYSIS										EFFECTIVE PRICING DATE			DATE PREPARED		
For use of this form, see TM 5-900-2; the proponent agency is USACE.										January 1992			April 1992		
PROJECT Irwin Army Community Hospital - EEAP										DRAWING NO.			SHEET OF SHEETS		
LOCATION Fort Riley, Kansas										ESTIMATOR			CHECKED BY R. D. Frymire		
TASK DESCRIPTION		QUANTITY		MH		LABOR		EQUIPMENT		MATERIAL		SHIPPING			
		NO. OF UNITS	UNIT MEAS	UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	UNIT WT	TOTAL WT		
STEEL BOLLARDS-2	2	EA													
RELOC. ENTRY DOORS	1	EA													
ADD ENTRY	1	EA													
NEW SIDE LITE	1	EA													
RELOC/ADJ AUTO SENSORS	2	EA				175	350								
SUBTOTAL															
CONTRACTOR															
SUBTOTAL															
SIGN 6%															
TOTAL															
TOTAL THIS SHEET															

AMBULANCE ENTRY REVISIONS
 (GENERAL COMMENT --- ITEM --- NO. 21)
IACH - EEP



HEATING BIN

FOR FORT RILEY, KS OCTOBER TO APRIL, 24 HR/DAY
REFER: TM 5-785

BIN	AVG TEMP °F	HOURS 0-24	°F HOURS
50/54	52	424	22048
45/49	48	473	22704
40/44	42	528	22176
35/39	37	600	22200
30/34	32	595	19040
25/29	27	466	12582
20/24	22	327	7194
15/19	17	223	3791
10/14	12	141	1692
5/9	7	96	672
0/4	2	43	86
-5/-1	-3	21	-63
-10/-6	-8	4	-32
		3,941	134,090

AVERAGE WINTER OUTSIDE AIR TEMPERATURE

$$\frac{134,090 \text{ °F HOURS}}{3,941 \text{ HOURS}} = 34 \text{ °F}$$

COOLING BIN

FOR FT. RILEY, KS MAY TO SEPTEMBER, 24 HR/DAY
REFER TM 5-785

BIN	AVG TEMP °F	HOURS 0-24	°F HOURS
75/79	77	587	45199
80/84	82	479	39278
85/89	87	314	27318
90/94	92	181	16652
95/99	97	65	6305
100/104	102	20	2040
		1646	136,792

AVERAGE OUTSIDE AIR TEMPERATURE

$$\frac{136,792}{1646} = 83^{\circ}\text{F db}$$

$$\text{MCWB} = 69^{\circ}\text{F}$$



Horton's Easy Access™ Operator

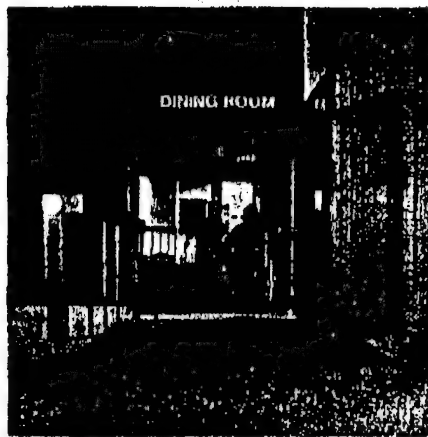
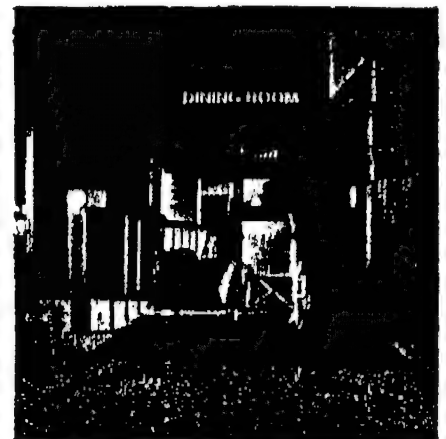
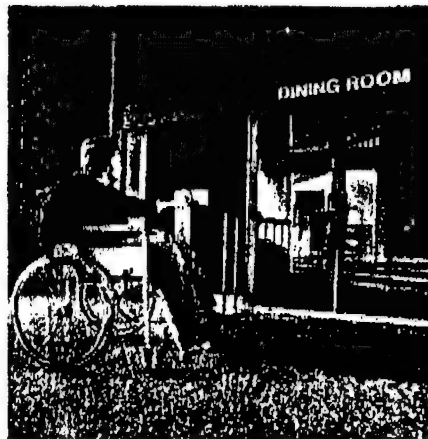
LOW ENERGY BARRIER FREE SWINGING DOOR OPERATOR

SERIES 7000 ADVANTAGES

- Low Energy Automatic Swing Operator
- Manual/Automatic
- Barrier Free Entry
- Complies with ANSI A117 and A156.19
- Requires No Structural Changes
- Easy Installation

OPERATOR FEATURES

- Slow Opening - Slow Closing - Speed Adjustable
- Adjustable Time Delay
- Time Out - Safety Feature - Cuts Off Operator Opening Force When Stalled
- Push Button Actuation
- "PUSH-N-GO" Optional Power Assist



"Easy Access" is a manual/automatic swing door operator especially for barrier-free openings for the handicapped. May be installed on an existing swing door. It is a low-powered, slow-opening operator that includes adjustable time delay to hold door in open position (variable 1-25 seconds). NOTE: Handicap codes require a 5 second setting. It meets the requirement of ANSI standard A156.19 when adjusted in accordance with the standard.

Two methods of actuating the automatic door are available. The control box is furnished with a switch that enables the owner to select the desired operation.

1. Manual operation when pushed open; automatic operation when activated by push-button switch.

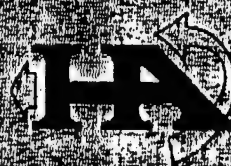
The most common controlling device is a push-button switch that can be located on the door or adjacent door jamb. Proper placement of the switch allows the general public to use the operator as a manual door — effectively conserving energy — as well as an automatic door when push-button actuated. The door automatically opens and then recloses after time-delay expiration.

2. "Push and Go" — Automatic operation by either pushing the door open manually or by push-button switch. The time delay before closing when manually pushed is 30% less than when push-button is actuated.

Horton's "Push and Go" feature makes the door easy to operate for everyone. Simply pushing on the door turns on the operator. It will open at the set speed and then close.

"Time Out" is another feature. When an obstruction is met during the open cycle, the operator will trip out of the automatic mode and enter the manual mode.

This slow-speed operator concept can lower installation cost — as much as 50% — by eliminating need for guard rails and floor switch mats.



Horton Automatic

INSTALL AN OCCUPANCY SENSOR LIGHT SWITCH IN THE 1975 ADDITION OFFICES THAT ARE OCCUPIED 12 HR/DAY AND THAT CONTAIN AT LEAST 1 FOUR LAMP FLUORESCENT FIXTURE. THE AVERAGE OFFICE CONTAINS 1 FOUR LAMP FIXTURE. FROM MANUFACTURER AND USER STUDIES WHICH WE HAVE RESEARCHED 50% SAVINGS ARE INDICATED. OUR LATEST ESTIMATE INDICATES 300 ROOMS QUALIFY.

$$300 \text{ ROOMS} \times \frac{0.2 \text{ KW}}{\text{ROOM}} \times 12 \frac{\text{HR}}{\text{DAY}} \times 5 \frac{\text{DAY}}{\text{WEEK}} \times 52 \frac{\text{WEEK}}{\text{YR}} \times 0.5 = 93,600 \text{ KWH}$$

ANNUAL ENERGY SAVING

$$93,600 \text{ KWH} \times 3413 \text{ BTU/KWH} = 319.4 \times 10^6 \text{ BTU/YR}$$

ANNUAL DOLLAR SAVING

$$93,600 \text{ KWH} \times 0.038 \text{ \$/KWH} = 3557 \text{ \$/YR}$$

COST ESTIMATE ANALYSIS										EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 9-800-2; the proponent agency is USACE.										January 1992		April 1992	
PROJECT		INVITATION/CONTRACTOR		CODE (Check one)		DRAWING NO.		SHEET		OF		SHEETS	
Irwin Army Community Hospital - EEAP		X A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/>		ESTIMATOR		R. D. Frymire		CHECKED BY					
LOCATION		OTHER		EQUIPMENT		MATERIAL		TOTAL		UNIT		TOTAL	
Fort Riley, Kansas				LABOR		UNIT PRICE		COST		UNIT PRICE		COST	
TASK DESCRIPTION		QUANTITY		MH		TOTAL HRS		UNIT PRICE		COST		TOTAL WT	
		NO. OF UNITS		UNIT MEAS									
OCCUPANCY SENSOR		300		EA				15		4500		85 25500 30,000	
CONTRACTOR OH		15%										4500	
" PROFIT		10%										3000	
SUBTOTAL												37500	
CONSTRUCTION COST												37500	
SLOH		6%										2250	
TOTAL THIS SHEET												39,750	

SUMMARY OF ENERGY SAVINGS FOR PROJECT

BLDG 600	WINDOWS	269.5 MCF
BLDG 610	WINDOWS	418 MCF
BLDG 600	MAIN ENTRY	1299 MCF
BLDG 600	EMERGENCY ENTRY	<u>87 MCF</u>
		1973.5 MCF

BLDG 600	WINDOWS	35,695 KWH
BLDG 610	WINDOWS	139,517 KWH
BLDG 600	MAIN ENTRY	10,534 KWH
BLDG 600	EMERGENCY ENTRY	708 KWH
BLDG 600	OCCUPANCY SENSOR	<u>93,600 KWH</u>
		280,054 KWH

TOTAL ANNUAL ENERGY SAVING

$$\begin{aligned}
 1973.5 \text{ MCF} \times 1.031 \times 10^6 \text{ BTU/KWH} &= 2034.7 \times 10^6 \\
 280,054 \text{ KWH} \times 3413 \text{ BTU/KWH} &= \underline{955.8 \times 10^6} \\
 &= 2990.5 \times 10^6 \text{ BTU/YR}
 \end{aligned}$$

TOTAL ANNUAL DOLLAR SAVINGS

$$\begin{aligned}
 1973.5 \text{ MCF} \times 3.7 \text{ \$/MCF} &= 7302 \\
 280,054 \text{ KWH} \times 0.038 \text{ \$/KWH} &= \underline{10642} \\
 &= 17,944 \text{ \$/YR}
 \end{aligned}$$

ANNUAL DEMAND SAVINGS

$$4846 \$ - 2848 \$ = 1998 \$/\text{YR}$$

TOTAL ANNUAL NON RECURRING MAINTENANCE
FOR CAULKING
BLDG 610 \$4,760

TOTAL ANNUAL RECURRING SAVINGS FOR DEMAND
AND WINDOW WASHING

BLDG 600	NONE - GLASS AREA REMAINS SAME	
BLDG 610	WASHING	312 \$/YR
BLDG 610	DEMAND	<u>1998 \$/YR</u>
		2310 \$/YR

COST ESTIMATE ANALYSIS				INVITATION/CONTRACTOR				EFFECTIVE PRICING DATE				DATE PREPARED			
For use of this form, see TM 8-800-2; the proponent agency is USACE.								MARCH 1992				MARCH 18, 1992			
PROJECT				CODE (Check one)				DRAWING NO.				SHEET 1 OF 3 SHEETS			
IRWIN ARMY COMMUNITY HOSPITAL - EEAP				<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C								CHECKED BY			
LOCATION				<input type="checkbox"/> OTHER				ESTIMATOR				R. D. FRYMIRE			
FORT RILEY, KANSAS				WAB											
TASK DESCRIPTION	QUANTITY		MH	TOTAL HRS	LABOR		EQUIPMENT	MATERIAL		TOTAL	SHIPPING				
	NO. OF UNITS	UNIT MEAS			UNIT PRICE	COST		UNIT PRICE	COST		UNIT WT	TOTAL WT			
SHEET 2 OF 3										56006					
SHEET 3 OF 3										88998					
SUBTOTAL										145084					
SUBCONTRACTOR ON 15%										21763					
PROFIT 10%										14510					
TOTAL										181357					
TOTAL THIS SHEET															

COST ESTIMATE ANALYSIS										INVOITATION/CONTRACTOR		EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 5-800-2; the proponent agency is USACE.										MARCH 1992		MARCH 18, 1992			
PROJECT IRWIN ARMY COMMUNITY HOSPITAL - EEAP										CODE (Check one) <input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C		DRAWING NO.		SHEET 2 OF 3 SHEETS	
LOCATION FORT RILEY, KANSAS										<input type="checkbox"/> OTHER		ESTIMATOR WAB		CHECKED BY R. D. FRYMIRE	
TASK DESCRIPTION	QUANTITY		MH	TOTAL HRS	LABOR		EQUIPMENT		MATERIAL		TOTAL	SHIPPING			
	NO. OF UNITS	UNIT MEAS			UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST		UNIT WT	TOTAL WT		
SUMMARY															
BUILDING 600															
DEMOLITION	1	EA									831				
2 FUR WINDOWS	SF	355			4.81	1707			25.2	8946	10653				
BAKERY & DINE WINDOWS	20	EA			39	780			250	5000	5780				
CAULKING	525	LF			1.01	530			.18	95	625				
RELOCATE MAIN ENTRY	LS	1									750				
NEW STOREFRONT	SF	240			2.78	667			12	2880	3547				
PREP SOFFIT	1	LS									650				
ELECTRIC RELAYSINS	1	LS									450				
RELOCATE EMER. DOOR	1	EA									1000				
ADD ENTRY & BOLLARDS	1	EA									750				
NEW SIDE LIGHT	1	EA									700				
RELOCATE SENSORS	2	EA			175	350					350				
OCCUPANCY SENSORS	300	EA			15	4500			85	25500	30000				
TOTAL THIS SHEET											56086				

installation: IRWIN ARMY COMMUNITY HOSPITAL, FT. RILEY, KANSAS

project: ENERGY ENGINEERING ANALYSIS PROGRAM (EEAP)

project number _____
temporary: _____ program year _____

permanent: _____ category code _____

point of contact:

user
name Maj. James Fletcher date 28 August 1991

title Chief of Logistics phone (913) 239-7207
autovon _____

dfae
name Larry Stillwagon date 20 August 1991

title Base Energy Officer phone (913) 239-2371
autovon _____

engineer district
name Robert Miller date 28 August 1991

title Project Manager phone (816) 426-2782
autovon _____

other (A-E)
name Randall D. Frymire date 27 August 1991

title Project Manager phone (816) 931-2200
autovon _____

reviewed by:

installation facility engineer
name Larry Stillwagon date 28 August 1991

title Base Energy Officer phone (913) 239-2371
autovon _____

approved by:

macom engineer
name _____ date _____

title _____ phone _____
autovon _____

project development brochure, PDB-1

facility

IRWIN ARMY COMMUNITY HOSPITAL
FT. RILEY, KANSAS

project coordinator for using service

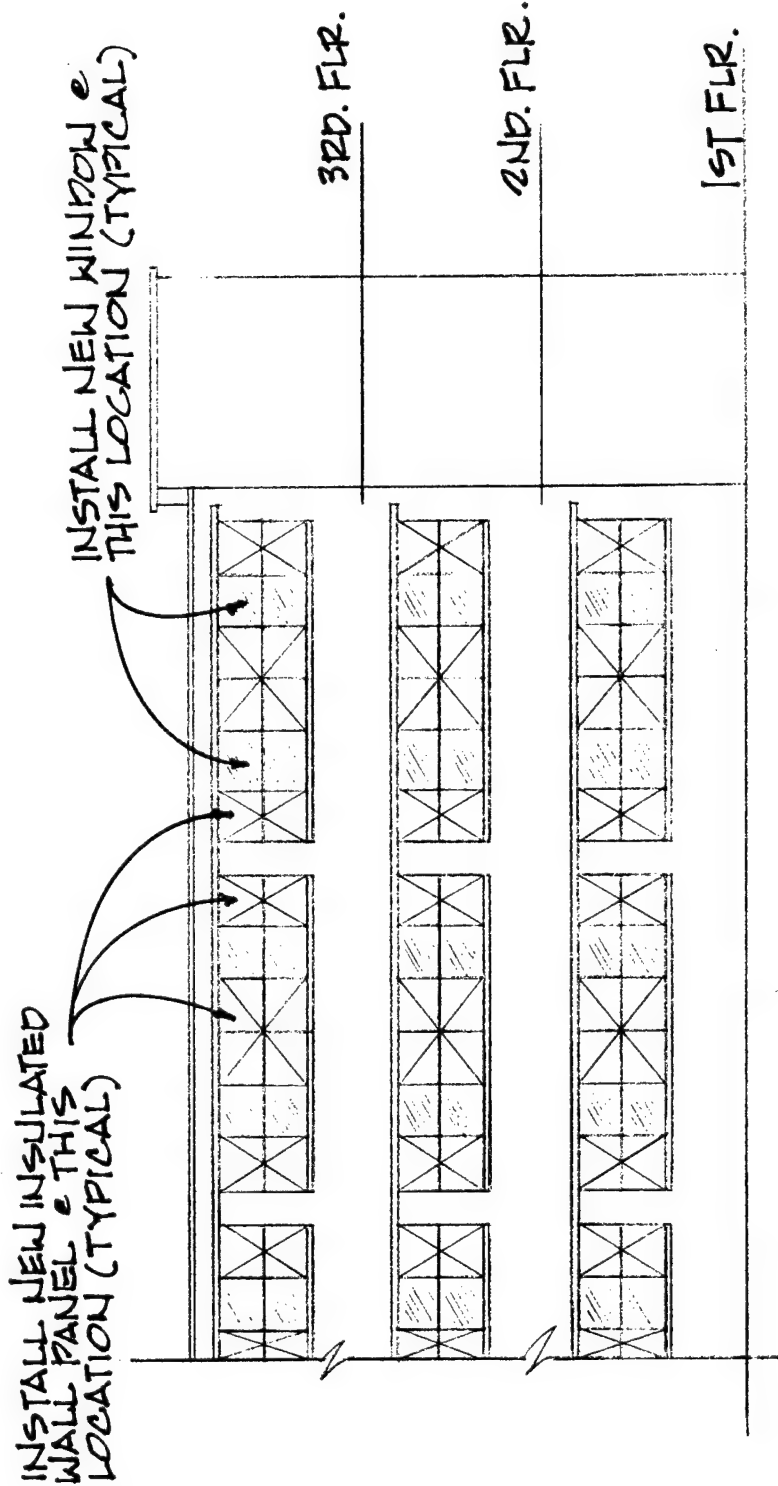
LARRY STILLWAGON
BASE ENERGY OFFICER

functional requirements summary, PDB-1

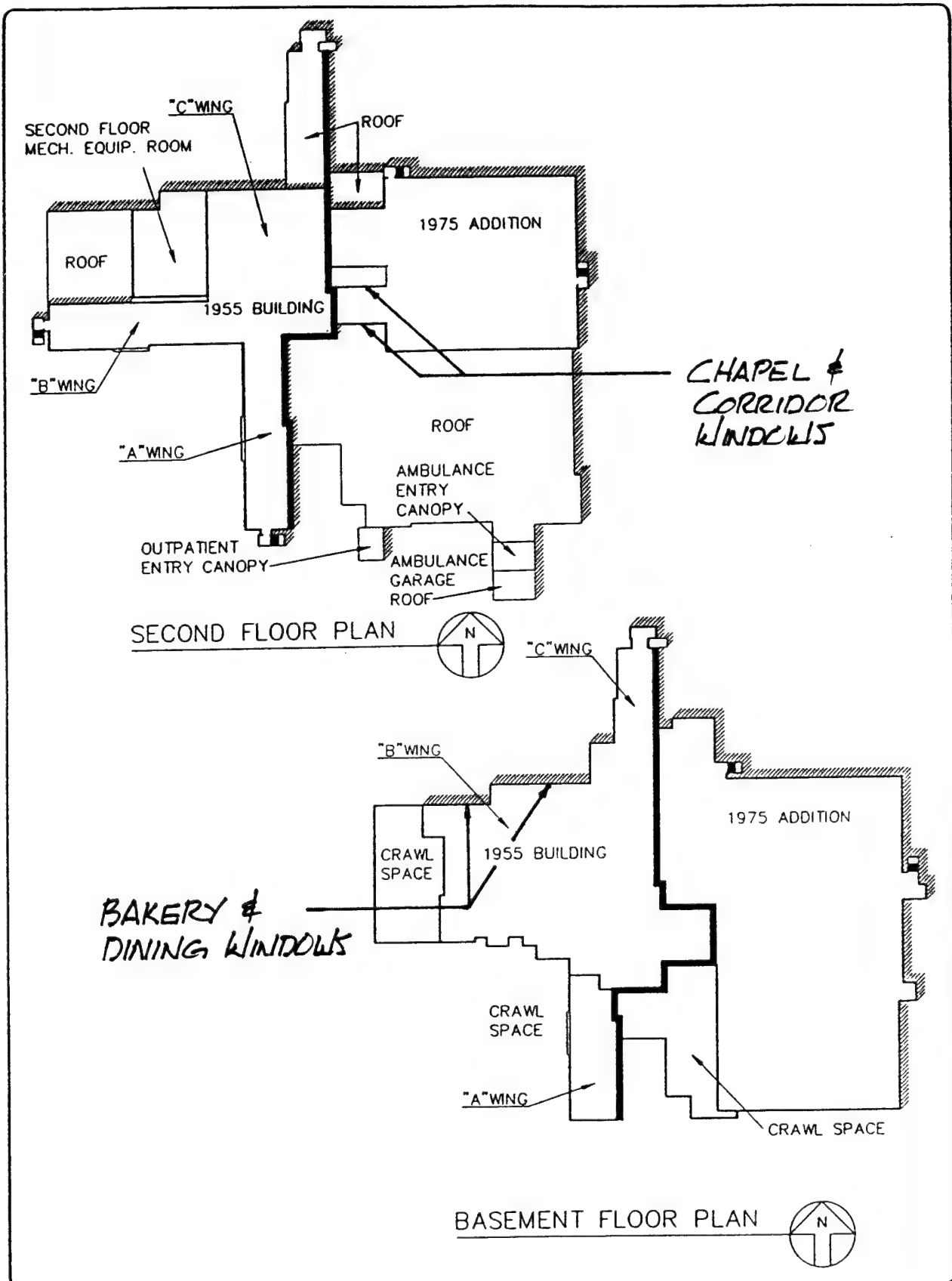
OBJECTIVE

The objective of this project is to update windows and door entries in Building 600 and 610 that have not been upgraded in previous projects. The work required would be to install new tinted 1" insulated glass windows with thermal break frames and 2" insulated wall panels in place of existing single pane glass windows with storms in Building 610 and to install new tinted 1" insulated glass windows with thermal break frames in the bakery, dining, chapel and second floor corridor in Building 600. Other architectural work includes extending the current Emergency/Outpatient entry vestibule, extending the hospital main entry and adjusting the hold-open devices on the emergency vestibule doors to reduce the amount of time both doors are open. It also includes installing occupancy sensors in the 1975 addition office to control the lights.

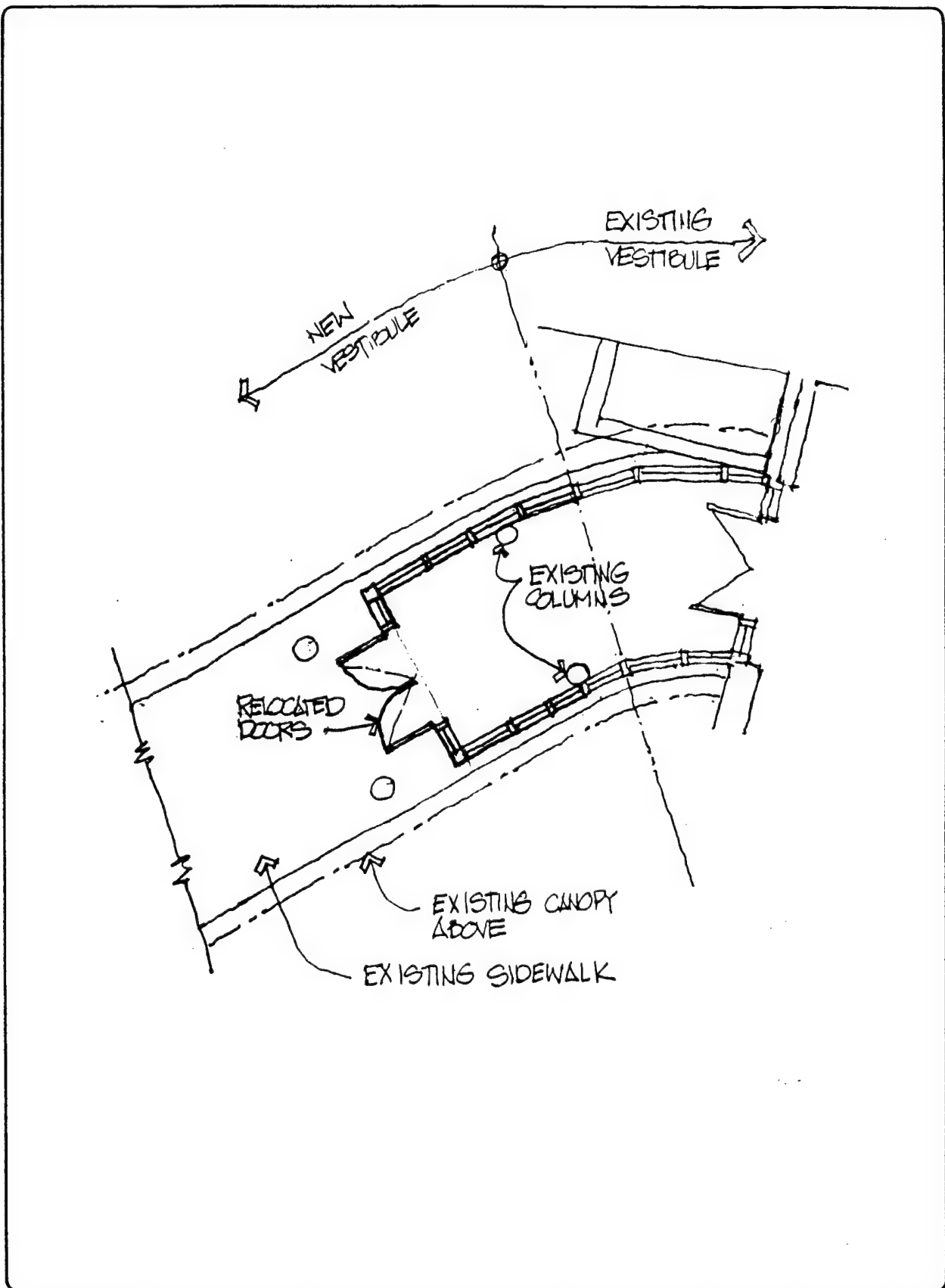
functional requirements summary, PDB-1



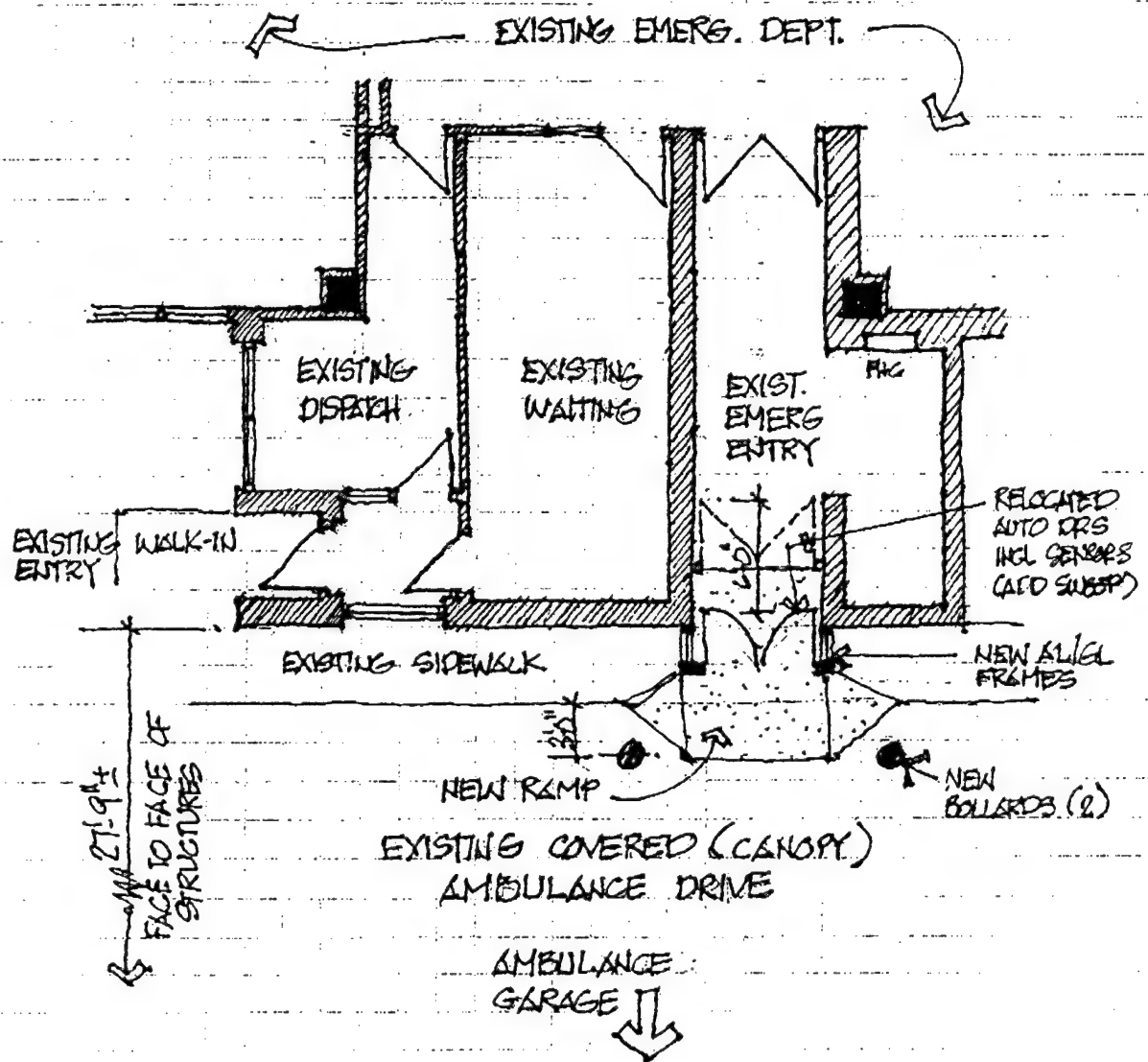
BUILDING ELEVATION



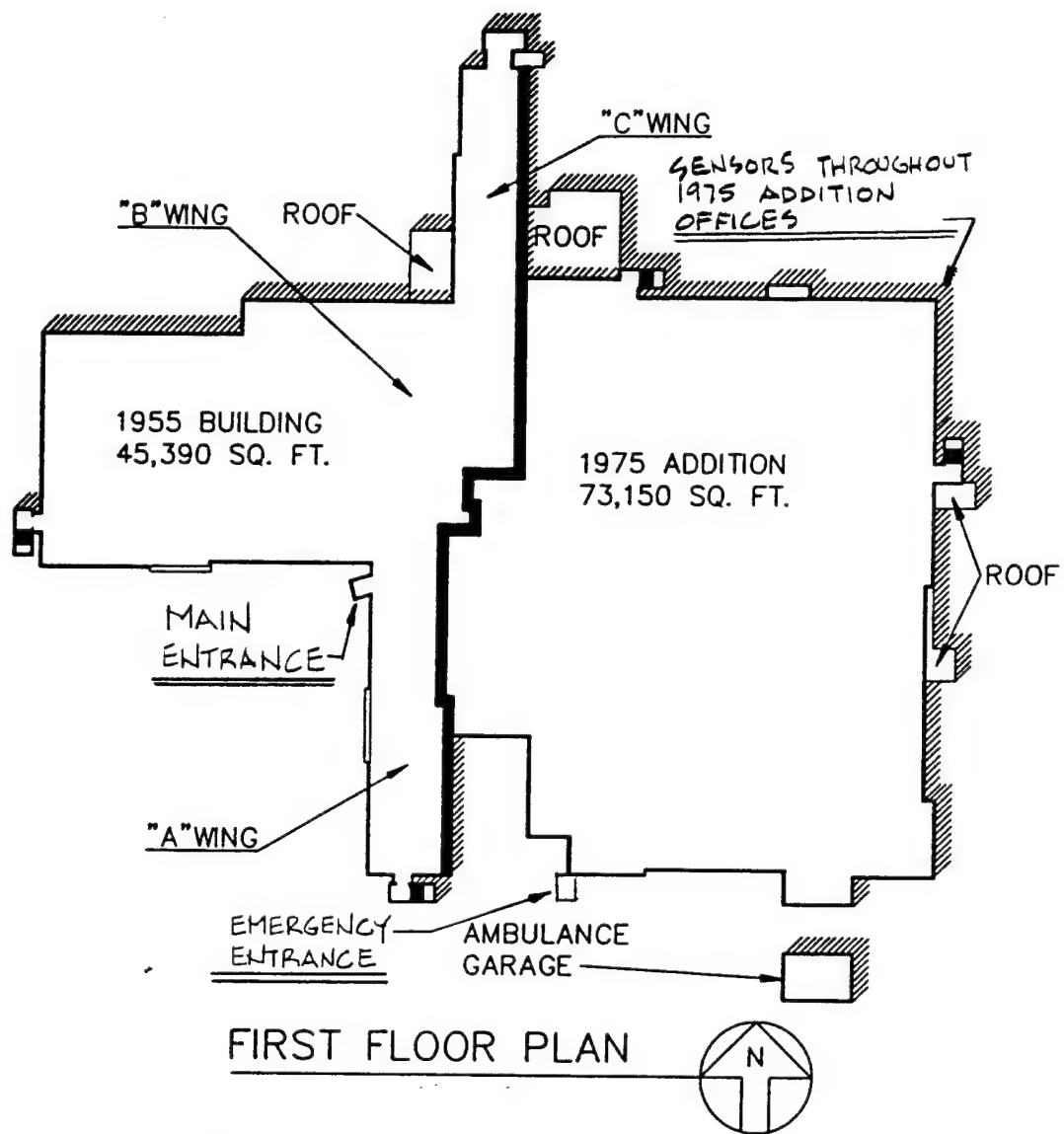
facilities requirements sketch, PDB- 1/2



facilities requirements sketch, PDB- 1/2



facilities requirements sketch, PDB- 1/2



BUILDING 600

facilities requirements sketch, PDB- 1/2

A. SPECIAL CONSIDERATIONS

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
A-1	Cost estimates for each primary and supporting facility	R			
A-2	Telecommunications system coordination with USACC and authorization for exceptions	R			
A-3	Coordination with state and local governmental requirements (blind vendors, medical facilities, construction and operating permits, clearinghouse coordination, etc.)	R			
A-4	Assignment of airspace	R			
A-5	Economic analysis of alternatives	R			
A-6	Approval for new starts	R			
A-7	International balance of payments (IBOP) coordination with U.S. European command and NATO—overseas cost estimates and comparables (include rate of exchange used in estimates)	R			
A-8	Impact on historic places—on site survey by authorized archeologist and coordination with state historic preservation officer and advisory council on historic preservation	R			
A-9	Exceptions to established criteria	R			
A-10	Coordination with various staff agencies (Provost Marshall-physical security, etc.)	R			
A-11	Identification of related or support projects (so projects can be coordinated)	R			
A-12	Required completion date	R			
Other Special Considerations (List and number items)					

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently available. Enter code for information source.

COMMENT ATTACHED — Significant information summarized or explained and attached.

DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

*** BY WHOM** (Check and insert appropriate letter)

A — DFAE

B — Using Service

C — Construction Service

D — Designer

E — Other (Check Comments Attached and explain)

documentation checklist

B. SITE DEVELOPMENT

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
B-1	Consultation with the District Office to determine and evaluate flood plain hazards	NR			
B-2	Preparation, submission, and/or approval of new				
(A)	General Site Plan	NR			
(B)	Annotated General Site Plan	NR			
(C)	Sketch Site Plan	NR			
(D)	Facilities Requirements Sketch	NR			
B-3	Preparation of				
(A)	Site Survey	NR			
(B)	Subsoil information	NR			
B-4	Approval by Department of Defense Explosive Safety Board (DDESB) for Safety Site Plan	NR			
	Other Site Development Considerations (List and number items)	NR			

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A — OFAE

B — Using Service

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documentation checklist

C. ARCHITECTURAL & STRUCTURAL

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
C-1	Reconciliation with troop housing programs and requirements	R			
C-2	Evaluation of existing facilities (including degree of utilization)	R			
C-3	Approval for removal and relocation of existing useable facilities	R			
C-4	Evaluation of off-post community facilities	R			
C-5	Storage and maintenance facilities (including nuclear weapons)	R			
C-6	Coordination hospitals, medical and dental facilities with Surgeon General	R			
C-7	Coordination of aviation facilities with FAA	R			
C-8	Coordination air traffic control and navigational aids with USACC	R			
C-9	Tabulation of types and numbers of aircraft	R			
C-10	Evaluation of laboratory, research and development, and technical maintenance facilities	R			
C-11	Coordination chapels with Chief of Chaplains	R			
C-12	Review food service facilities by USATSA	R			
C-13	Automated data processing system or equipment approvals—cost analysis when ADP and/or communication centers not co-located with related facilities	R			
C-14	Coordination postal facilities with U.S. Postal Service Regional Director	R			
C-15	Laundry and dry cleaning facilities coordination with ASD(I&L)	R			
C-16	Tenant facilities coordination with installation where sited	R			
C-17	Facilities for or exposed to explosions, toxic chemicals, or ammunition—review by DDESB (See also Item B-4)	NR			
C-18	Analysis of deficiencies	NR			
C-19	Consideration of alternatives	NR			
C-20	Determination whether occupants will include physically handicapped or disabled persons	NR			
C-21	As-build drawings for alterations or additions	NR			
C-22	Availability of Standard Design or site adaptable designs	NR			
	Other Architectural & Structural (List and number items)	NR			

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documentation checklist

D. MECHANICAL, ELECTRICAL, & UTILITY SYSTEMS

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
D-1	Fuel considerations and cost comparison analysis	R	R		
D-2	Energy requirements appraisal (ERA)	R	R		
D-3	Conformance with DOD Energy Reduction requirements	R	R		
D-4	Evaluation of existing and/or proposed utility systems	R	R		
	Other Mechanical and Utility Systems (List and number items)	R	R		

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documentation checklist

DA FORM 5023-D-R, Feb 82

E. ENVIRONMENTAL CONSIDERATIONS

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
E-1	Environmental impact assessment	NR			
E-2	EIA conclusions require Environmental Impact Statement	NR			
E-3	Determination of health, environmental or related hazards. Assistance to determine existence of any health, environmental or related hazard may be requested from Aberdeen Proving Ground, MD 21010, the Office of the Surgeon General, Attn: DASG-HCH (Army Environmental Hygiene Agency)	NR			
E-4	Air/water pollution permit, coordination with agencies and compliance with standards at Federal, state and local level	NR			
E-5	Corrective measures associated with Environmental Impact Statements or assessment—list separately and evaluate.	NR			
	Other environmental considerations (list and number items)	NR			

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E — Other (Check Comments Attached and explain)

documentation checklist

A. SPECIAL CONSIDERATIONS

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
A-1	Factors of risk, restriction or unusual circumstance expected to increase costs beyond applicable area averages	NR			
A-2	Construction phasing requirements	NR			
A-3	Functional support equipment (mechanical, electrical, structural, and security) to be built in	NR			
A-4	Equipment in place and justification	NR			
A-5	Other equipment and furniture (O&MA, OPA) and costs	NR			
A-6	Special studies and tests (hazards analyses, compatibility testing, new technology testing, etc.)	NR			
A-7	Type of construction (permanent, temporary, semi-permanent)	NR			
A-8	Government furnished equipment (quantities, procurement time, availability and special handling and storage requirements). Funds used for procurement.	NR			
	Other special considerations (list and number items)	NR			

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technical data checklist

B. SITE DEVELOPMENT		Required or Not Required	To Be Determined	Comment Attached	Document Attached
ITEM					
B-1	Construction restrictions or guidelines pertaining to site access and preferred construction routes	NR			
(A)					
(B)	Airfield clearance, explosive storage, working hours, safety, etc.	NR			
(C)	Facilities and/or functions or adjoining areas (structures, materials, impact)	NR			
B-2	Real estate actions (acquisition, disposal, lease, right-of-way)	NR			
B-3	Demolition/relocation required (data)				
(A)	Special considerations due to explosives/radioactivity/chemical contamination/asbestos emissions/toxic gases	NR			
(B)	Restrictions on disposal of demolished/relocated material including hazardous waste	NR			
B-4	Pavement types and requirements (including traffic surveys and MTMC coordination)	NR			
B-5	Landscape considerations				
(A)	Protection of existing vegetation	NR			
(B)	Stockpile topsoil	NR			
	Other Site Development (List and number items)	NR			

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

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technical data checklist

C. ARCHITECTURAL & STRUCTURAL

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
C-1	Vibration-producing equipment requiring isolation	NR			
C-2	Seismic zone and other design load criteria (typhoon, hurricane, earthquake loads, high or low loss potential)	NR			
C-3	Protective shelter evaluation and resistant design criteria (conventional/nuclear blast and radiation, chemical/biological)	NR			
C-4	Unusual foundation requirements (pier, pile, caisson, deep foundations, mat, special treatment, permafrost areas, soil bearing)	-			
C-5	Designation and strength of units to be accommodated	NR			
C-6	Requirements and data for special design projects	NR			
C-7	Unusual floor and roof loads (safes, equipment)	NR			
C-8	Security features (arms rooms, vaults, interior secure areas)	NR			
	Other Architectural & Structural (List and number items)	NR			

REQUIRED OR NOT REQUIRED – Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

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E – Other (Check Comments Attached and explain)

technical data checklist

D. MECHANICAL, ELECTRICAL, & UTILITY SYSTEMS

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
D-1	Special mechanical requirements or considerations (elevator, crane, hoist, etc.)	R			
D-2	Special peak usage periods and peak leveling techniques	R			
D-3	Maintenance considerations (accessibility of equipment, compatibility with existing equipment)	R			
D-4	Plumbing—availability, general system type and characteristics (proposed and/or existing, incl. compressed air and gas)	R			
D-5	Heating—availability, general system type and characteristics (proposed and/or existing)	R			
D-6	Ventilating, air condition/refrigeration—availability, general system type and characteristics (proposed and/or existing)	R			
D-7	Electrical—availability, general system type and characteristics incl. airfield lighting, communication, etc. (proposed and/or existing)	R			
D-8	Water supply/waste treatment—availability, general system type and characteristics (proposed and/or existing)	R			
D-9	Energy requirements/fuel conversion (sources, availability, loads, types of fuel, etc.)	NR			
D-10	Solar energy evaluation	NR			
	Other Mechanical & Utility Systems (List and number items)	NR			

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TO BE DETERMINED — Information needed but not currently available. Enter code for information source.

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C — Construction Service

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E — Other (Check Comments Attached and explain)

technical data checklist

E. ENVIRONMENTAL CONSIDERATIONS

ITEM		Required or Not Required	* To Be Determined	Comment Attached	Document Attached
E-1	Waste water treatment, air quality, and solid waste disposal criteria Other Environmental Considerations (List and number items)	NR NR			

REQUIRED OR NOT REQUIRED – Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

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- E – Other (Check Comments Attached and explain)

technical data checklist

COST ESTIMATE ANALYSIS										EFFECTIVE PRICING DATE		DATE PREPARED			
For use of this form, see TM 5-800-2; the proponent agency is USACE.										January 1992		April 1992			
PROJECT		INVITATION/CONTRACTOR								DRAWING NO.		SHEET 1 OF 5 SHEETS			
Irwin Army Community Hospital - EEAP		CODE (Check one)								ESTIMATOR		CHECKED BY			
LOCATION		<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> OTHER								R. D. Frymire					
Fort Riley, Kansas		QUANTITY		MH		TOTAL HRS		LABOR		EQUIPMENT		MATERIAL		SHIPPING	
TASK DESCRIPTION		NO. OF UNITS	UNIT MEAS	UNIT	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	UNIT WT	TOTAL WT	
KINDRED REPLACEMENT															
SHEET 2 OF 5															
SHEET 3 OF 5															
SHEET 4 OF 5															
SHEET 5 OF 5															
SUBTOTAL															
CONTRACTOR OH @ 15%															
SUBTOTAL															
CONTRACTOR PROFIT @ 10%															
SUBTOTAL															
CONTINGENCIES @ 5.5%															
CONSTRUCTION COST															
SIOH @ 6.0%															
TOTAL THIS SHEET															

COST ESTIMATE ANALYSIS										EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 5-800-2; the proponent agency is USACE.										January 1992		April 1992	
PROJECT Irwin Army Community Hospital - EEAP										DRAWING NO.		SHEET 2 OF 5 SHEETS	
LOCATION Fort Riley, Kansas										ESTIMATOR		CHECKED BY	
										R. D. Frymire			
TASK DESCRIPTION		QUANTITY		LABOR		EQUIPMENT		MATERIAL		SHIPPING			
		NO. OF UNITS	UNIT MEAS	MH UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT WT	TOTAL WT		
SECOND FLOOR CORRIDOR													
REMOVE EXISTING													
6'-3" H x 12'-0" L													
WINDOW SECTION													
TOTAL OF 3 SECT.		225	SF	—	—	.93	210	—	—	—	210		
INSTALL NEW BRONZE													
TINTED WINDOWS/W													
THERMAL BREAK &													
1-INCH INSULATING													
GLASS		225	SF	—	—	4.81	1083	—	—	25.2	5670		
CAULK NEW WINDOWS		150	LF	—	—	1.01	152	—	—	0.18	27		
TOTAL THIS SHEET											7142		

COST ESTIMATE ANALYSIS										INVOITATION/CONTRACTOR		EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 5-800-2; the proponent agency is USACE.												January 1992		April 1992	
PROJECT		Irwin Army Community Hospital - EEAP								CODE (Check one)		DRAWING NO.		SHEET 3 OF 5 SHEETS	
LOCATION		Fort Riley, Kansas								<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C		ESTIMATOR		CHECKED BY	
										<input type="checkbox"/> OTHER				R. D. Frymire	
TASK DESCRIPTION	QUANTITY		MH	LABOR		EQUIPMENT		MATERIAL		TOTAL	SHIPPING				
	NO. OF UNITS	UNIT MEAS		UNIT PRICE	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST		UNIT WT	TOTAL WT			
SECOND FLOOR CHAPEL WINDOWS															
REMOVE EXISTING															
6'-6" H X 20'-0" L															
SECTION OF ALUM															
WINDOWS	130	SF	-	.93	121	-	-	-	-	121					
INSTALL NEW BRONZE															
TINTED WINDOWS/W															
THERMAL BREAK &															
1-INCH INSULATING															
GLASS	130	SF	-	4.81	625	-	-	25.2	3276	3901					
CALK NEW WINDOWS	100	LF	-	1.01	101	-	-	0.18	18	119					
TOTAL THIS SHEET										4141					

COST ESTIMATE ANALYSIS										EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 5-800-2; the proponent agency is USACE.										January 1992		April 1992	
PROJECT Irwin Army Community Hospital - EEAP										DRAWING NO.		SHEET 4 OF 5 SHEETS	
LOCATION Fort Riley, Kansas										ESTIMATOR		CHECKED BY R. D. Frymire	
TASK DESCRIPTION		QUANTITY		MH		LABOR		EQUIPMENT		MATERIAL		SHIPPING	
		NO. OF UNITS	UNIT MEAS	UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	UNIT WT	TOTAL WT
DINING ROOM WINDOWS													
REMOVE EXISTING													
8'-9" H x 19'-6" L PRO													
STEEL FRAME WINDOWS 12 EA							25					300	
INSTALL NEW BRONZE													
WINDOW UNITS 14													
THERMAL BREAK &													
1-INCH TINTED													
INSULATING GLASS 12 EA							39			250	3000	3468	
CAULK NEW WINDOWS 200 LF							1.01				36	230	
TOTAL THIS SHEET												4006	

COST ESTIMATE ANALYSIS										INVOITATION/CONTRACTOR		EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 5-800-2; the proponent agency is USACE.												January 1992		April 1992	
PROJECT Irwin Army Community Hospital - EEAP										CODE (Check one) <input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C		DRAWING NO.		SHEET 5 OF 5 SHEETS	
LOCATION Fort Riley, Kansas										<input type="checkbox"/> OTHER		ESTIMATOR		CHECKED BY R. D. Frymire	
TASK DESCRIPTION	QUANTITY		MH	LABOR		EQUIPMENT		MATERIAL		TOTAL	SHIPPING				
	NO. OF UNITS	UNIT MEAS		UNIT PRICE	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST		UNIT WT	TOTAL WT			
BAKERY WINDOWS															
REMOVE 3'-6" x 16'-0"															
FIXED SASH PAINTED															
STEEL WINDOW UNITS	8	EA	—	—	15	—	—	—	—	200					
INSTALL NEW BRONZE															
ALUM. WINDOW UNITS															
W/THERMAL BREAK &															
1-INCH TINTED															
INSULATING GLASS	8	EA	—	—	39	312	—	—	250	2000	2312				
CAULK NEW WINDOWS	75	LF	—	—	1.01	76	—	—	0.18	14	90				
TOTAL THIS SHEET											2607				

COST ESTIMATE ANALYSIS										EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 5-800-2; the proponent agency is USACE.										January 1992		April 1992	
PROJECT		Irwin Army Community Hospital - EEAP								DRAWING NO.		SHEET 1 OF 3 SHEETS	
LOCATION		Fort Riley, Kansas								ESTIMATOR		CHECKED BY	
										R. D. Frymire			
TASK DESCRIPTION		QUANTITY		LABOR		EQUIPMENT		MATERIAL		SHIPPING			
		NO. OF UNITS	UNIT MEAS	MH	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	UNIT WT	TOTAL WT
SHEET 2													
SHEET 3													
SUBTOTAL													
CONTRACTOR OH @ 15%													
SUBTOTAL													
CONTRACTOR PROFIT @ 10%													
SUBTOTAL													
CONTINGENCIES @ 5.5%													
CONSTRUCTION COST													
SIQH @ 6.0%													
TOTAL THIS SHEET													

COST ESTIMATE ANALYSIS										EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 5-800-2; the proponent agency is USACE.										January 1992		April 1992	
PROJECT		INVITATION/CONTRACTOR								DRAWING NO.		SHEET 2 OF 3 SHEETS	
Irwin Army Community Hospital - EEAP		CODE (Check one) <input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> OTHER								ESTIMATOR		CHECKED BY	
LOCATION												R. D. Frymire	
Fort Riley, Kansas		QUANTITY		MH		LABOR		EQUIPMENT		MATERIAL		SHIPPING	
TASK DESCRIPTION		NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	UNIT WT	TOTAL WT
INSULATING GLASS (REPLACE KIDOW UNITS - BUILDING 610)													
REMOVE EXISTING													
SINGLE PANE & D.H.													
ALUM. KIDOW UNITS													
& INTERIOR STORM													
WINDOWS		339	EA	—	15	5085	—	—	—	—	—	5085	
INSTALL NEW DOUBLE													
HUNG BRONZE TINTED													
ALUM WINDOW UNITS													
W/THERMAL BREAK,													
1-INCH INSULATING													
GLASS & SCREENS		101	EA	—	39	3939	—	—	200	20,200	24139		
TOTAL THIS SHEET											29,224		

COST ESTIMATE ANALYSIS										EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 5-800-2; the proponent agency is USACE.										January 1992		April 1992	
PROJECT		INVITATION/CONTRACTOR		CODE (Check one)		DRAWING NO.		SHEET 3 OF 3 SHEETS		CHECKED BY		R. D. Frymire	
LOCATION		Fort Riley, Kansas		OTHER		ESTIMATOR							
TASK DESCRIPTION	QUANTITY		MH	TOTAL HRS	LABOR		EQUIPMENT		MATERIAL		TOTAL	SHIPPING	
	NO. OF UNITS	UNIT MEAS			UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST		UNIT WT	TOTAL WT
INSTALL 2-INCH													
THICK PROCELEAN													
FINISHED INSULATING													
PANELS (3'-0" X 5'-0")													
IN 238 KINDOOKS	2570	SF	—	—	3.01	10,746	—	—	12.40	44,268	55014		
CAULK NEW KINDOOKS													
4 PANELS	4000	LF	—	—	1.01	4040	—	—	0.18	71.0	4760		
TOTAL THIS SHEET											59,774		

COST ESTIMATE ANALYSIS										INVOITATION/CONTRACTOR		EFFECTIVE PRICING DATE		DATE PREPARED	
Per use of this form, see TM 8-600-2; the proponent agency is USACE.										ECO 20		January 1992		April 1992	
PROJECT Irvin Army Community Hospital - EEAP										CODE (Check one) <input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C		DRAWING NO. —		SHEET 1 OF 2 SHEETS	
LOCATION Fort Riley, Kansas										<input type="checkbox"/> OTHER		ESTIMATOR KB		CHECKED BY R. D. Frymire	
TASK DESCRIPTION	QUANTITY		MH	TOTAL HRS	LABOR		EQUIPMENT		MATERIAL		TOTAL	SHIPPING			
	NO. OF UNITS	UNIT MEAS			UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST		UNIT WT	TOTAL WT		
SHEET 3 OF 3 - Sub 1											8434				
CONTINGENCIES		5.5%									464				
CONSTRUCTION COST											8898				
STOH		6%									534				
TOTAL THIS SHEET											9432				

COST ESTIMATE ANALYSIS				INVOITATION/CONTRACTOR				EFFECTIVE PRICING DATE				DATE PREPARED	
PROJECT Irwin Army Community Hospital - EEAP				Eco 20				January 1992				April 1992	
LOCATION Fort Riley, Kansas				CODE (Check one) <input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C				DRAWING NO. —				SHEET 2 OF 3 SHEETS	
BIDDING EMD				<input type="checkbox"/> OTHER				ESTIMATOR WB				CHECKED BY R. D. Frymlire	
TASK DESCRIPTION	QUANTITY		MH	LABOR		EQUIPMENT		MATERIAL		TOTAL	SHIPPING		
	NO. OF UNITS	UNIT MEAS		UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST		UNIT WT	TOTAL WT	
HOSPITAL ENTRY	1	LS											
RELOCATE, RESET													
ONE PAIR OF EXISTING													
32x72 AL ENTRY DRS													
INCL SIDE & TRANSOM													
LIGHTS	1	LS								750			
EXISTING													
AL STORE FRONT													
SIDEWALL SYSTEM													
24'-0" x 10'-0" 1/4	240	SF		2.70	667			12	2880	3547			
PREP EXISTING													
CANOPY SUPPORT AND													
EXPOSED BRIMS, OF													
EXISTING ALUM													
TOTAL THIS SHEET													

COST ESTIMATE ANALYSIS										EFFECTIVE PRICING DATE		DATE PREPARED			
Per use of this form, see TM 8-400-2; the proponent agency is USACE.										January 1992		April 1992			
PROJECT Irwin Army Community Hospital - EEAP										DRAWING NO. —		SHEET 3 OF 3 SHEETS			
LOCATION Fort Riley, Kansas										ESTIMATOR LB		CHECKED BY R. D. Frymire			
INVOITATION/CONTRACTOR										EQUIPMENT		MATERIAL		SHIPPING	
CODE (Check one)										UNIT PRICE		COST		UNIT WT	
<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> OTHER										UNIT PRICE		COST		UNIT WT	
TASK DESCRIPTION		QUANTITY		LABOR		EQUIPMENT		MATERIAL		TOTAL		TOTAL WT			
NO. OF UNITS	UNIT MEAS	MH	UNIT	TOTAL MHS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL	UNIT WT	TOTAL WT		
1	LS														
1	LS														
1	LS														
1	LS														
15%															
10%															
15%															
10%															
Sub total						CONSTRUCTION COST TOTAL				8434					
TOTAL THIS SHEET															

COST ESTIMATE ANALYSIS										EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 5-800-2; the proponent agency is USACE.										January 1992		April 1992	
PROJECT		INVITATION/CONTRACTOR		DRAWING NO.		SHEET		OF		SHEETS			
Irwin Army Community Hospital - EEAP		CODE (Check one)		ESTIMATOR		CHECKED BY		R. D. Frymire					
LOCATION		OTHER		EQUIPMENT		MATERIAL		SHIPPING					
Fort Riley, Kansas				UNIT PRICE		COST		UNIT WT		TOTAL WT			
TASK DESCRIPTION		QUANTITY		LABOR		EQUIPMENT		MATERIAL		SHIPPING			
NO. OF UNITS	UNIT MEAS	MH	UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	UNIT WT		
ECO 26													
STEEL BOLLARDS-2													
RELOC. ENTRY DOORS													
ADD ENTRY													
NEW SIDE LITE													
RELOC/ADJ AUTO SENSORS													
SUBTOTAL													
CONTRACTOR													
OH @ 15%													
PROFIT @ 10%													
SUBTOTAL													
SIGN 6%													
TOTAL													
TOTAL THIS SHEET													

COST ESTIMATE ANALYSIS				INVOITATION/CONTRACTOR				EFFECTIVE PRICING DATE				DATE PREPARED			
For use of this form, see TM 5-800-2; the proponent agency is USACE.								January 1992				April 1992			
PROJECT				CODE (Check one)				DRAWING NO.				SHEET OF SHEETS			
Irwin Army Community Hospital - EEAP				<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C								CHECKED BY			
LOCATION				<input type="checkbox"/> OTHER				ESTIMATOR				R. D. Frymire			
Fort Riley, Kansas															
TASK DESCRIPTION	QUANTITY		MH	LABOR		EQUIPMENT		MATERIAL		TOTAL	SHIPPING				
	NO. OF UNITS	UNIT MEAS		UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST		UNIT WT	TOTAL WT			
OCCUPANCY SENSOR	300	EA		15	4500			85	25500	30,000					
CONTRACTOR OH	15%									3915					
" PROFIT	10%									2610					
SUBTOTAL										32625					
CONSTRUCTION COST										32625					
SIQH	6%									1957					
TOTAL THIS SHEET										34582					

2. HVAC MODIFICATION

1. COMPONENT ARMY		FY 19 <u>95</u> MILITARY CONSTRUCTION PROJECT DATA			2. DATE 19 APR 1992 14 APR 1992	
3. INSTALLATION AND LOCATION Fort Riley Kansas			4. PROJECT TITLE ECIP HVAC Sys Mod			
5. PROGRAM ELEMENT	6. CATEGORY CODE 510 10	7. PROJECT NUMBER 40476	8. PROJECT COST (\$000) 1,050			
9. COST ESTIMATES						
ITEM	U/M	QUANTITY	UNIT COST	COST (\$000)		
PRIMARY FACILITY				844		
1975 ADD Mod	EA	1	688798	(689)		
1955 Bldg Mod	BD	1	154922	(155)		
SUPPORTING FACILITIES				54		
Design Cost	LS	---	---	(54)		
ESTIMATED CONTRACT COST				898		
CONTINGENCY PERCENT (10.0%)				90		
SUBTOTAL				988		
SUPERVISION, INSPECTION & OVERHEAD (6.00%)				59		
CATEGORY E EQUIPMENT				(0)		
TOTAL REQUEST				1,047		
TOTAL REQUEST (ROUNDED)				1,050		
INSTALLED EQUIPMENT-OTHER APPROPRIATIONS				(0)		
10. DESCRIPTION OF PROPOSED CONSTRUCTION						
Convert air handling units in the 1975 Addition of the hospital to single duct variable volume reheat by installing variable volume boxes and variable frequency drives. Convert the vane axial supply air fans in the 1955 Hospital building to fixed pitch with variable frequency drives. Perform all necessary piping, electrical and support work.						
11. REQUIREMENT:						
PROJECT: Modification to existing air handling units and ductwork in the 1975 Hospital Addition to convert to single duct variable volume with terminal reheat and modify the supply air fans in the 1955 Building.						
REQUIREMENT: This project is required to reduce gas energy used by the single duct constant volume reheat system to heat the space air flow and reduce the electrical energy by the reduction of the fan air flow quantities in the 1975 Addition along with reducing the gas and electrical energy due to improved air flow control and less maintenance costs by fan drive replacement in the 1955 Building.						

1. COMPONENT ARMY	FY 19 ⁹⁵ MILITARY CONSTRUCTION PROJECT DATA		2. DATE 19 APR 1992 14 APR 1992									
3. INSTALLATION AND LOCATION Fort Riley Kansas												
4. PROJECT TITLE ECIP HVAC Sys Mod		5. PROJECT NUMBER 40476										
<p>CURRENT SITUATION:</p> <p>The 1975 Hospital Addition is heated and cooled by six single duct constant volume terminal reheat systems with one unit being 100 percent outside air and another unit being a minimum 40 percent outside air. The reheat system cools the supply air to a minimum temperature and then reheats the air at each zone not calling for cooling. The air handling units are sized for the sum of the peak loads and are generally oversized. The 1955 Hospital building is served by eleven air handling unit systems. Of these eleven systems six are dual duct variable volume units with in-flight adjustable pitch vane axial fans. These fans require continuous maintenance due to the mechanical linkage required for in-flight blade adjustment.</p> <p>IMPACT IF NOT PROVIDED:</p> <p>Failure to approve this project will continue the excess energy being used to heat, cool and deliver the supply air throughout the 1975 Addition and 1955 Building and continued excessive maintenance of the fans in the 1955 Building.</p> <p>ADDITIONAL:</p> <p>This project complies with the scope and design criteria of CEHSC-FU-M "Energy Conservation Investment Program (ECIP) Guidance," that were in effect June 1991. The project has a Discounted Savings Ratio (SIR) of 1.69 and a simple payback of 5.23 years. The implementation of this project will provide an annual energy savings of 23,979 MBTU and an annual dollar savings of \$188,642.</p> <p>Project validation will be through the use of metering gas flow at the Energy Plant boilers and metering electric consumption at the Hospital. Comparison of total annual gas and electric consumption along with engineering calculations will be utilized.</p> <table border="0"> <tr> <td>ESTIMATED CONSTRUCTION START:</td> <td>APR 1995</td> <td>INDEX: 1809</td> </tr> <tr> <td>ESTIMATED MIDPOINT OF CONSTRUCTION:</td> <td>OCT 1995</td> <td>INDEX: 1843</td> </tr> <tr> <td>ESTIMATED CONSTRUCTION COMPLETION:</td> <td>APR 1996</td> <td>INDEX: 1867</td> </tr> </table>				ESTIMATED CONSTRUCTION START:	APR 1995	INDEX: 1809	ESTIMATED MIDPOINT OF CONSTRUCTION:	OCT 1995	INDEX: 1843	ESTIMATED CONSTRUCTION COMPLETION:	APR 1996	INDEX: 1867
ESTIMATED CONSTRUCTION START:	APR 1995	INDEX: 1809										
ESTIMATED MIDPOINT OF CONSTRUCTION:	OCT 1995	INDEX: 1843										
ESTIMATED CONSTRUCTION COMPLETION:	APR 1996	INDEX: 1867										

1. COMPONENT ARMY	FY 19_92 MILITARY CONSTRUCTION PROJECT DATA	2. DATE Rev. 1/16/92 3 Sept. 1991
3. INSTALLATION AND LOCATION Irwin Army Community Hospital Fort Riley, Kansas		
4. PROJECT TITLE HVAC System Modifications (ECIP)		5. PROJECT NUMBER

THIRD FLOOR PLAN

1. COMPONENT ARMY	FY 19 <u>92</u> MILITARY CONSTRUCTION PROJECT DATA	2. DATE Rev. 1/16/92 3 Sept. 1991
3. INSTALLATION AND LOCATION Irwin Army Community Hospital Fort Riley, Kansas		
4. PROJECT TITLE HVAC System Modifications (ECIP)	5. PROJECT NUMBER	

The diagram is a schematic floor plan of the Sixth Floor. It features a central vertical corridor. To the left of the corridor is the 'B' WING, which includes a 'SIXTH FLOOR PENTHOUSE' and a 'ROOF' area. To the right of the corridor is the '1955 BUILDING PENTHOUSE' and another 'SIXTH FLOOR PENTHOUSE'. Below the corridor, there is an 'A' WING with two 'AIR HANDLING' units labeled 'UNIT AS-1' and 'UNIT AS-2', and a 'ROOF' area. The plan also shows various other rooms and structural elements indicated by hatching and lines.

SIXTH FLOOR PLAN

1. COMPONENT ARMY	FY 19 <u>92</u> MILITARY CONSTRUCTION PROJECT DATA	2. DATE Rev. 1/16/92 3 Sept. 1991
3. INSTALLATION AND LOCATION Irwin Army Community Hospital Fort Riley, Kansas		
4. PROJECT TITLE HVAC System Modifications (ECIP)	5. PROJECT NUMBER	

SECOND FLOOR PLAN

1. COMPONENT ARMY	FY 19⁹² MILITARY CONSTRUCTION PROJECT DATA	2. DATE 3 Sept. 1991 Rev. 1/16/92
3. INSTALLATION AND LOCATION Irwin Army Community Hospital Fort Riley, Kansas		
4. PROJECT TITLE HVAC System Modifications (ECIP)		5. PROJECT NUMBER

The diagram is a basement floor plan. It shows a complex layout of rooms and corridors. Key features include:

- 1955 BUILDING**: The central part of the plan, containing several rooms and corridors.
- 1975 ADDITION**: A large rectangular area on the right side of the plan.
- WINGS**: Labeled as "A" WING (bottom left), "B" WING (middle left), and "C" WING (top left).
- CRAWL SPACE**: Indicated in several locations, including a large area on the left and smaller spaces near the wings.
- AIR HANDLING UNIT CE-1**: Located near the top of the 1955 Building.
- North Arrow**: A circle with an 'N' and an arrow pointing upwards, located at the bottom right of the plan.

BASEMENT FLOOR PLAN

INTRODUCTION

The air handling units S-1, S-2, S-3, S-4, S-5 and S-7 located in the 1975 Addition will be converted to single duct variable volume reheat systems by the installation of variable volume boxes with reheat coils in the existing ductwork and variable frequency drives on the air handling units and return/relief fans. Constant volume boxes would need to be installed in areas with specific pressure relationship requirements such as lab, x-ray and central sterile. S-7 air handling unit will be converted from 100 percent outside air to a minimum outside air with return air to satisfy TM5-838-2 air flow requirements for the areas served. In addition, all air handling unit outside air dampers will be replaced with new low leakage dampers and the chilled water coil 3-way valves will be replaced with new 2-way valves. This modification will result in less gas energy used by the single duct variable volume reheat system since the terminal coils only heat the space minimum air flow required, the outside air quantities have been reduced and the old chilled water valves are replaced with new valves. Less electrical energy will be used by the reduction of the fan air flow quantity and reduction of the refrigeration load in response to the space load diversity. The TRACE 600 program was used to compare the energy consumption of the existing system verses the modified system. The existing system was modeled in base run T0095080 ALT 1 and the modified system was modeled in T00105080 ALT 1.

The supply fans located in the 1955 Building air handling units, A6-1, A6-2, B6-1, B2-1, B2-2 and CB-1 will be modified/converted to fixed pitch vane axial fans with variable frequency drives. The existing air handling units are variable volume type with in-flight adjustable pitch vane axial fans. This modification will result in more efficient air flow control for the variable volume units and less maintenance cost. Less gas and electrical energy will be consumed for air flow conditioning due to improved air

flow control. The TRACE 600 program was used to compare the energy consumption of the existing system verses the modified system. The existing system was modeled in base run T0095080 ALT 1 and the modified system was modeled in T0105080 ALT 2.

ASSUMPTIONS

District Piping Loses = 10%

Heat Exchanger Efficiency = 80%

Gas Cost = \$3.7 /MCF

Elect. Cost = \$0.038/KWH

1975 ADDITION

Age of Existing Equipment = 16 years

Equipment Service Life: (ASHRAE Handbook 1987)

Diffusers, Grilles & Registers = 27 years

VAV & Double Duct Boxes = 20 years

Ductwork = 30 years

Fans (Centrifugal) = 25 years

Dampers = 20 years

Motor Starters = 17 years

1955 ADDITION

Age of Existing Equipment = 4 years (B6-1, B2-1 & B2-2)

3 years (A6-1, A6-2 & CB-1)

Equipment Service Life: (ASHRAE Handbook 1987)

Fans (Axial) = 20 years

Electric Motors = 18 years

Motor Starters = 17 years

LIFE CYCLE COST ANALYSIS SUMMARY

ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: Fort Riley, Ks. REGION NO.: 7 PROJECT NO.: 40476
 PROJECT TITLE: HVAC System Modifications FISCAL YR.: 1995
 DISCRETE PORTION NAME: HVAC Mod
 ANALYSIS DATE: 4-15-92 ECONOMIC LIFE 11 YEARS PREPARED BY: RDF

1. INVESTMENT

A. CONSTRUCTION COST \$ 893864
 B. SIOH \$ 52632
 C. DESIGN COST \$ 52632
 D. SALVAGE VALUE - \$ 13690
 E. TOTAL INVESTMENT (1A + 1B + 1C - 1D) \$ 987438

2. ENERGY SAVINGS (+) / COST (-)

ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	COST \$/MBTU/YR(1)	SAVINGS MBTU/YR(2)	ANNUAL \$ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	\$ <u>11.13</u>	<u>10817</u>	\$ <u>120398</u>	<u>8.45</u>	\$ <u>1017365</u>
B. DIST	\$ <u> </u>	<u> </u>	\$ <u> </u>	<u> </u>	\$ <u> </u>
C. RESID	\$ <u> </u>	<u> </u>	\$ <u> </u>	<u> </u>	\$ <u> </u>
D. NG	\$ <u>3.59</u>	<u>13162</u>	\$ <u>47251</u>	<u>9.92</u>	\$ <u>468729</u>
E. COAL	\$ <u> </u>	<u> </u>	\$ <u> </u>	<u> </u>	\$ <u> </u>
F. TOTAL		<u>23979</u>	\$ <u>167649</u>		\$ <u>1486094</u>

3. NONENERGY SAVINGS(+) / COST (-)

A. ANNUAL RECURRING (+/-)
 (1) DISCOUNT FACTOR (TABLE A) 8.44
 (2) DISCOUNTED SAVING/COST (3A X 3A1) \$ 19586
 \$ 165306

B. NONRECURRING SAVINGS (+) / COST (-)

ITEM	SAVINGS(+) / COST(-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR(3)	DISCOUNTED SAVINGS (+) COST (-) (4)
(1) M.STRTR	\$ <u>6960</u>	<u>2</u>	<u>.91</u>	\$ <u>6334</u>
(2) DAMPERS	\$ <u>8520</u>	<u>4</u>	<u>.83</u>	\$ <u>7072</u>
(3) <u> </u>	\$ <u> </u>	<u> </u>	<u> </u>	\$ <u> </u>
(4) TOTAL	\$ <u>15480</u>			\$ <u>13405</u>

C. TOTAL NONENERGY DISCOUNTED SAVINGS (+) / COST (-) (3A2+3BD4) \$ 178711

D. PROJECT NONENERGY QUALIFICATION TEST

(1) 25% MAX NONENERGY CALC (2F5 X .33) \$ 490411
 a. IF 3D1 IS = OR > 3C GO TO ITEM 4
 b. IF 3D1 IS < 3C CALC S1R = (2F5 + 3D1) / 1E =
 c. IF 3D1b IS = > 1 GO TO ITEM 4
 d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3 + 3A + (3B1d / YEARS ECONOMIC LIFE) \$ 188642

5. TOTAL NET DISCOUNTED SAVINGS (2F5 + 3C) \$ 1664805

6. DISCOUNTED SAVINGS RATIO (IF < 1 PROJECT DOES NOT QUALIFY) (SIR) = (5 / 1E) = 1.69

7. SIMPLE PAYBACK PERIOD (ESTIMATED YEARS) SPB = 1E/4 5.23

CALCULATIONS

Heating and cooling energy can be saved by replacing the air handling unit outside air dampers with new low leakage dampers. The estimated reduction in outside air leakage through the dampers is 5 percent of the total outside air quantity for each unit. The energy savings is as follows:

S-1	350	Winter BIN Temp. = 34.8 deg. F
S-2	300	Winter Space Temp. = 68 deg. F
S-3	315	Summer BIN Enthalpy = 33.2 deg. F
S-4	230	Summer Space Enthalpy = 30 deg. F
S-5	500	
S-7	<u>900</u>	
2,595 CFM		

Heating Energy Saved Annually

$$\begin{aligned} &2,595 \text{ CFM} \times 1.08 \times (68 \text{ deg. F} - 24.8 \text{ deg. F}) \times 1.1 / \\ &\quad .78 \text{ EFF} \times 4,197 \text{ BIN Hrs} = 550.7 \times 106 \\ &550.7 \times 106 / 1.031 \times 106 \text{ BTU/MCF} = 550.7 \times 106 \text{ MCF} \end{aligned}$$

Cooling Energy Saved Annually

$$\begin{aligned} &2,595 \text{ CFM} \times 4.45 \times (33.2 - 30) / 12,000 \text{ BTU/Ton} = 3.1 \text{ tons} \\ &3.1 \text{ tons} \times 1,782 \text{ BIN hrs} \times 0.98 \text{ KW/Ton} = 5,414 \text{ KWH} \end{aligned}$$

Difference in 1975 Addition Energy Consumption

Base run T0095080 Alt 1 annual KWH = 9,339,166

Modified system T00105080 Alt 1 KWH = 6,233,196

Energy saved due to new dampers, KWH = + 5,414

3,111,384

Base run annual MCF = $52,476.92 \times 1.1 / 0.8 = 72,156$

Modified system MCF = $43,892.53 \times 1.1 / 0.8 = 60,352$

Energy saved due to new dampers, MCF = + 534

12,338

Difference in 1955 Building Energy Consumption

Base run T0095080 Alt 1 annual KWH = 9,339,166

Modified system T0105080 Alt 2 KWH = 9,281,063

58,103 KWH

Base run annual MCF = $541,037 \text{ Therms} \times \frac{0.1 \times 10^6}{1.031 \times 10^6} = 52,477$

1.031 x 106

Modified system MCF = $537,833 \text{ Therms} \times \frac{0.1 \times 10^6}{1.031 \times 10^6} = \underline{52,166}$

1.031 x 106

= 311

Due to piping losses and heat exchanger eff.

annual MCF = $311 / 0.8 \times 1.1$

= 427.63

Total Annual Energy Savings

$$(3,111,384 \text{ KWH} + 58,103 \text{ KWH}) \times 3413 \text{ BTU/KWH} = 10,817.45 \times 106$$

$$(12,338 \text{ MCF} + 428 \text{ MCF}) \times 1.031 \times 106 \text{ BTU/MCF} = \underline{13,161.8 \times 106}$$

$$23,979.25 \times 106 \text{ BTU/YR}$$

Total Annual Dollar Savings

$$3,111,384 \text{ KWH} + 58,103 \text{ KWH}) \times .038 \text{ \$/KWH} = 120,440$$

$$(12,338 \text{ MCF} + 428 \text{ MCF}) \times 3.7 \text{ \$/MCF} = \underline{47,234}$$

$$167,674 \text{ \$/YR}$$

Study period life for this project will be limited to 11 years due to the effective remaining life of the existing equipment to be reused in the modified system. The existing fans in the 1975 air handling units were repaired in 1986 and are estimated to have 20 years remaining. Diffusers, grilles and registers in 1975 Addition are estimated to have 11 years remaining. The equipment in the 1955 Building is only 3 to 4 years old and is projected to have service life beyond 11 years.

Annual Recurring Maintenance for HVAC Systems:

Existing single duct constant volume reheat system, 542.6 tons x \$24/ton = \$13,022.00/year

Modified single duct variable volume reheat system, 441.8 tons x \$32/ton = \$14,137.00/year

Annual Recurring Maintenance Cost

= \$13,022.00 - 14,137.00

= \$ - 1,115.00

Nonrecurring expense for the existing 1975 system motor starters will occur in the second year of the study, from cost estimates the motor starter replacement = \$6,960.00

Motor Starters Cost Estimate

5 @ 50 HP = 3,475

1 @ 30 HP = 695

2 @ 15 HP = 950

2 @ 10 HP = 560

1 @ 7.5 HP = 280

Connections = 1,000

\$6,960

Nonrecurring expense for the existing system will occur in the fourth year for the replacement of equipment. From cost estimate damper replacement = \$8,520.00.

Annual recurring maintenance for 1955 Building fan systems are based on manufacturer's recommended procedures. Existing vane axial fans:

(1)	Motor Lubrication - 6 @ 1 Hr/Yr x \$38.00/Hr	=	\$228
(2)	Pillow Block Lub. - 6 @ 1 Hr/Yr x \$38.00/Hr	=	\$228
(3)	Rotor Thrust Brg. Lub. - 6 @ 1 Hr/Yr x \$38.00/Hr	=	\$228
(4)	Handwheel Adj. Lub. - 6 @ 1 Hr/Yr x \$38.00/Hr	=	\$228
(5)	Pitch Chg. Mech. Inspect. -		
	6 x 12 @ 1 Hr/Yr x \$38.00/Hr	=	\$2,736
(6)	Six Month Inspect. - 6 x 2 @ 3 Hr/Yr x \$38.00/Hr	=	\$1,368
(7)	Rotor Inspection - 6 @ 4 Hr/Yr x \$38.00/Hr	=	\$912
(8)	Blade Bearing Inspect. - 6 @ 8 Hr/Yr x \$38.00/Hr	=	<u>\$1,824</u>
			\$7,752

Fixed Pitch Fans with Frequency Drives:

(1)	Motor Lubrication - 6 @ 1 Hr/Yr x \$38.00/Yr	=	\$228
(2)	Pillow Block Lub. - 6 @ 1 Hr/Yr x \$38.00/Yr	=	\$228
(3)	Six Month Inspect. - 6 x 2 @ 3 Hr/Yr x \$38.00/Yr	=	<u>\$912</u>
			\$1,368

Annual Recurring Maintenance Difference

= \$7,752 - \$1,368

= \$6,384

Maintenance cost associated with belt inspection and tightening are assumed the same for both systems.

Total Annual Recurring Maintenance Savings

$$6,384 - 1,115 = 5,269 \text{ \$/YR}$$

Total Annual Nonrecurring Savings

$$8,520 + 6,960 = 15,480 \text{ \$/YR}$$

Total Annual Nonenergy Savings due to reduction in electric capacity charge (demand) calculated using the electric rate schedule.

MONTH	EXISTING SYSTEM		MODIFIED SYSTEM		SAVINGS
	BILLING DEMAND (KVA)	DEMAND CHARGE (dollars)	BILLING DEMAND (KVA)	DEMAND CHARGE (dollars)	
JANUARY	1023	4303.15	1007	4238.35	\$ 64.80
FEBRUARY	1022	4299.10	770	3278.50	\$ 1020.60
MARCH	1290	5384.50	948	3999.40	\$ 1385.10
APRIL	1350	5627.50	1023	4303.15	\$ 1324.35
MAY	2166	8932.30	1825	7551.25	\$ 1381.05
JUNE	2507	10313.35	2187	9017.35	\$ 1296.00
JULY	2693	11066.65	2386	9823.30	\$ 1243.35
AUGUST	2655	10912.75	2353	9689.65	\$ 1223.10
SEPTEMBER	2401	9884.05	2103	8677.15	\$ 1206.90
OCTOBER	1407	5858.35	1023	4303.15	\$ 1555.20
NOVEMBER	1281	5348.05	951	4011.55	\$ 1336.50
DECEMBER	1266	5287.30	950	4007.50	\$ 1279.80
TOTAL					\$14,316.75

COST ESTIMATE ANALYSIS										INVOITATION/CONTRACTOR		EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 5-800-2; the proponent agency is USACE.												January 1992		January 1992	
PROJECT		Irwin Army Community Hospital - BEAP								CODE (Check one)		DRAWING NO.		SHEET 1 OF 4 SHEETS	
LOCATION		Fort Riley, Kansas								<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> OTHER		HVAC SYSTEM MOD.		CHECKED BY	
		QUANTITY		LABOR		EQUIPMENT		MATERIAL		TOTAL		UNIT WT		SHIPPING	
TASK DESCRIPTION		NO. OF UNITS	UNIT MEAS	MH	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST				
SHEET 2 OF 4												288,265			
SHEET 3 OF 4												144,300			
SHEET 4 OF 4												96,900			
SUBTOTAL												529,465			
SUBCONTRACTOR OH @ 15%												79,420			
SUBCONTRACTOR PROFIT @ 10%												69,889			
SUBTOTAL												669,774			
GEN. CONTRACTOR OH @ 15%												100,466			
GEN. CONTRACTOR PROFIT @ 10%												77,024			
SUBTOTAL												847,264			
CONTINGENCIES @ 5.5%												46,600			
CONSTRUCTION COST BASED ON MEAN'S 1992 COST.												893,864			
SIQH @ 67%												53,632			
TOTAL THIS SHEET												947,496			

COST ESTIMATE ANALYSIS										INVOITATION/CONTRACTOR		EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 5-800-2; the proponent agency is USACE.												January 1992		January 1992	
PROJECT		Irwin Army Community Hospital - EEAP								CODE (Check one)		DRAWING NO.		SHEET 2 OF 4 SHEETS	
LOCATION		Fort Riley, Kansas								<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> OTHER		HVAC SYSTEM MOD.		CHECKED BY	
												ESTIMATOR		R. D. Frymire	
TASK DESCRIPTION		QUANTITY		MH	TOTAL HRS	LABOR		EQUIPMENT		MATERIAL		TOTAL	SHIPPING		
		NO. OF UNITS	UNIT MEAS			UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST		UNIT WT	TOTAL WT	
REPLACE O.A. DAMPERS															
INCLUDING OPERATORS															
ON 6 AHU'S IN 1975															
BLOG (344 TOTAL)		1	LS	—	—	—	2000	—	100	—	6420	8520			
REPLACE CHW 3-WAY															
VALVES W/ 2-WAY		6	EA	—	—	116.66	700	2.33	14	816.66	4900	5614			
REPLACE REHEAT COILS															
WITH VAY BOXES W/															
REHEAT		431	EA	—	—	1000	43,100	1	431	500	215,500	259,031			
TEMP. CONTROLS		1	LS	—	—	—	10,000	—	100	—	5000	15,100			
TOTAL THIS SHEET												288,265			

COST ESTIMATE ANALYSIS										EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 5-900-2; the proponent agency is USACE.										January 1992		January 1992	
PROJECT		INVTATION/CONTRACTOR		CODE (Check one)		DRAWING NO.		SHEET 3 OF 4		SHEETS			
Irwin Army Community Hospital - EEAP		X A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/>		HVAC SYSTEM MDD.		ESTIMATOR		CHECKED BY		R. D. Frymire			
LOCATION		OTHER		LABOR		EQUIPMENT		MATERIAL		SHIPPING			
Fort Riley, Kansas				UNIT PRICE		COST		UNIT PRICE		COST			
TASK DESCRIPTION		QUANTITY		MH		TOTAL HRS		UNIT PRICE		COST			
		NO. OF UNITS		UNIT MEAS									
FURNISH & INSTALL													
VARIABLE FREQ. DRIVES													
1975 ADDITION HVAC													
50 HP		5 EA		—		—		1000		5000			
30 HP		1 EA		—		—		1000		1000			
15 HP		2 EA		—		—		1000		2000			
10 HP		2 EA		—		—		1000		2000			
7 1/2 HP		1 EA		—		—		1000		1000			
MODIFY 1955 BUDG													
VANE AXIAL FAN													
ROTORS		11 EA		—		—		100		1100			
TOTAL THIS SHEET										144,300			

COST ESTIMATE ANALYSIS										EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 5-800-2; the proponent agency is USACE.										January 1992		January 1992	
PROJECT		Irwin Army Community Hospital - EEAP		INVESTMENT/CONTRACTOR		DRAWING NO.		HYAC SYSTEM MDP.		SHEET 4 OF 4 SHEETS			
LOCATION		Fort Riley, Kansas		CODE (Check one)		ESTIMATOR		WAB		CHECKED BY			
				<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> OTHER						R. D. Frymire			
TASK DESCRIPTION	QUANTITY		MH	LABOR		EQUIPMENT	MATERIAL		TOTAL	SHIPPING			
	NO. OF UNITS	UNIT MEAS		UNIT PRICE	COST		UNIT PRICE	COST		UNIT WT	TOTAL WT		
FURNISH & INSTALL													
VARIABLE FREQ. DRIVES													
1955 BLDG AB-1, AB-2,													
BB-1, BB-2, BB-2 & CB-1													
30 HP	2	EA		2000	4000	100	200	10,000	20,000	24,200			
25 HP	4	EA		2000	8000	100	400	10,000	40,000	48,400			
20 HP	2	EA		2000	4000	100	200	7000	14,000	18,200			
15 HP	1	EA		1000	1000	100	100	5000	5,000	6,100			
TOTAL THIS SHEET										96,900			

ANNUAL HEATING BIN

BIN CALCULATED FOR FT. RILEY/MARSHALL AAF
ANNUAL TOTAL OBSERVED NUMBER OF HOURS.

BIN	AVG TEMP	HOURS	°F HOURS
50/54	52	569	29,588
45/49	47	538	25,286
40/44	42	555	23,310
35/39	37	612	22,644
30/34	32	596	19,072
25/29	27	472	12,744
20/24	22	327	7,194
15/19	17	223	3,791
10/14	12	141	1,692
5/9	7	96	672
0/4	2	43	86
-5/-1	-3	21	-63
-10/-6	-8	4	-32
		4,197	145,984

AVERAGE WINTER TEMPERATURE

$$145,984 \text{ °F HRS} \div 4,197 \text{ HRS} = 34.8 \text{ °F}$$

ANNUAL COOLING BIN

BIN CALCULATED FOR FT RILEY/MARSHALL AAF
ANNUAL TOTAL OBSERVED NUMBER OF HOURS.

BIN	AVG TEMP	HOURS	°F HOURS
75/79	77	667	51,359
80/84	82	520	42,640
85/89	87	327	28,449
90/94	92	182	16,744
95/99	97	66	6,402
100/104	102	20	2,040
		1782	147,634

AVERAGE SUMMER TEMPERATURE

$$147,634 \div 1,782 = 82.8^{\circ}\text{F db}$$

69 °F MEAN COINCIDENT WET BULB

T4495080 ALT 1

MONTHLY ENERGY CONSUMPTION - ALTERNATIVE 1
EXISTING EQUIPMENT COMBINED COMPLEX

----- MONTHLY ENERGY CONSUMPTION -----

Month	ELEC	DEMAND	GAS	WATER
	On Peak (kWh)	On Peak (kW)		
			(Therm)	(1000 GL)
Jan	520,560	1,023	122,964	129
Feb	469,624	1,022	98,947	117
March	574,069	1,290	66,786	169
April	619,115	1,350	43,629	384
May	907,854	2,166	1,030	1,172
June	1,066,403	2,507	3,416	1,730
July	1,249,361	2,693	7,595	2,269
Aug	1,208,242	2,655	6,638	2,115
Sept	946,409	2,401	364	1,340
Oct	679,523	1,407	35,425	499
Nov	551,683	1,281	70,091	158
Dec	546,322	1,266	84,152	149
Total	9,339,166	2,693	541,037	10,230

Building Energy Consumption = 235,380 (Btu/Sq Ft/Year)
Source Energy Consumption = 417,725 (Btu/Sq Ft/Year)

Floor Area = 365,275 (Sq Ft)

TØ105080 ALT 1

MONTHLY ENERGY CONSUMPTION - ALTERNATIVE 1
ECO 23 REPLACE TRH WITH VRH IN 1975

----- MONTHLY ENERGY CONSUMPTION -----

Month	ELEC	DEMAND	GAS	WATER
	On Peak (kWh)	On Peak (kW)		
			(Therm)	(1000 GL)
Jan	330,551	887	116,390	129
Feb	298,067	768	92,448	117
March	383,856	947	55,721	168
April	423,064	1,023	28,846	190
May	612,055	1,905	974	617
June	717,796	2,266	0	1,019
July	825,328	2,465	2,164	1,432
Aug	827,178	2,430	2,345	1,343
Sept	637,095	2,179	0	748
Oct	444,107	1,023	19,809	228
Nov	363,886	949	59,448	158
Dec	370,215	949	74,386	148
Total	6,233,196	2,465	452,532	6,297

Building Energy Consumption = 182,129 (Btu/Sq Ft/Year)
Source Energy Consumption = 305,148 (Btu/Sq Ft/Year)

Floor Area = 365,275 (Sq Ft)

T ϕ 105080 ALT2

MONTHLY ENERGY CONSUMPTION - ALTERNATIVE 2
ECO 38 REPLACE FANS IN 1955 AHUS

----- MONTHLY ENERGY CONSUMPTION -----

Month	ELEC	DEMAND	GAS (Therm)	WATER (1000 GL)
	On Peak (kWh)	On Peak (kW)		
Jan	520,202	1,143	122,628	129
Feb	469,509	1,024	98,634	117
March	574,200	1,291	66,430	168
April	631,352	1,350	43,169	381
May	894,788	2,086	1,030	1,170
June	1,050,267	2,428	3,393	1,722
July	1,231,024	2,614	6,976	2,249
Aug	1,189,487	2,578	6,595	2,105
Sept	931,833	2,325	364	1,337
Oct	679,855	1,407	35,053	496
Nov	547,792	1,283	69,710	158
Dec	560,755	1,267	83,851	150
Total	9,281,063	2,614	537,833	10,183

Building Energy Consumption = 233,960 (Btu/Sq Ft/Year)
Source Energy Consumption = 415,173 (Btu/Sq Ft/Year)

Floor Area = 365,275 (Sq Ft)

installation: IRWIN ARMY COMMUNITY HOSPITAL, FT. RILEY, KANSAS

project: ENERGY ENGINEERING ANALYSIS PROGRAM (EEAP)

project number

temporary: _____ program year _____

permanent: _____ category code _____

point of contact:

user

name Maj. James Fletcher

date 28 August 1991

title Chief of Logistics

phone (913) 239-7207

autovon _____

dfae

name Larry Stillwagon

date 20 August 1991

title Base Energy Officer

phone (913) 239-2371

autovon _____

engineer district

name Robert Miller

date 28 August 1991

title Project Manager

phone (816) 426-2782

autovon _____

other (A-E)

name Randall D. Frymire

date 27 August 1991

title Project Manager

phone (816) 931-2200

autovon _____

reviewed by:

installation facility engineer

name Larry Stillwagon

date 28 August 1991

title Base Energy Officer

phone (913) 239-2371

autovon _____

approved by:

macom engineer

name _____

date _____

title _____

phone _____

autovon _____

project development brochure, PDB-

facility

IRWIN ARMY COMMUNITY HOSPITAL
FT. RILEY, KANSAS

project coordinator for using service

LARRY STILLWAGON
BASE ENERGY OFFICER

functional requirements summary, PDB-1

OBJECTIVE

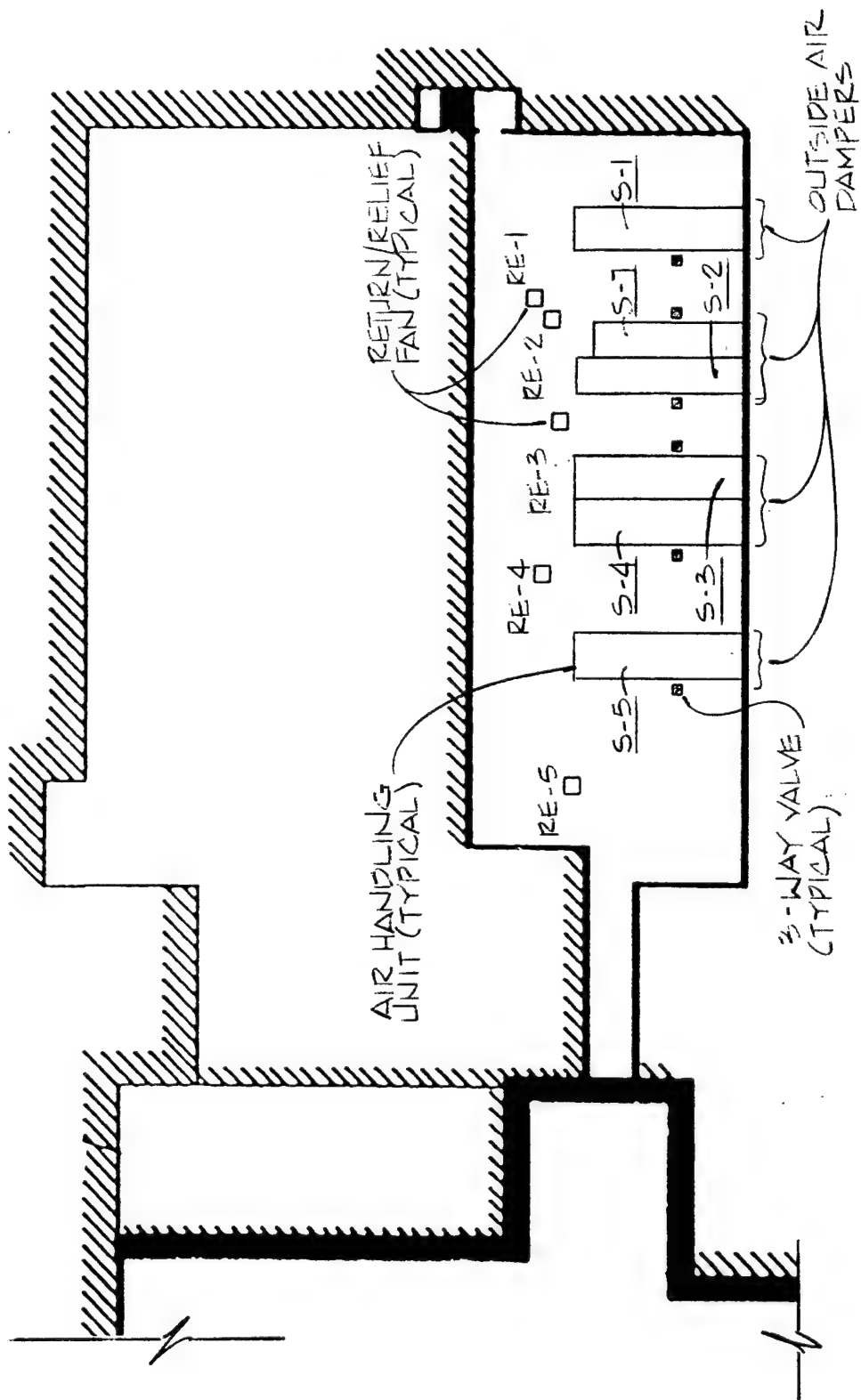
The objective of this project is to convert air handling units S-1, S-2, S-3, S-4, S-5 and S-7 in the 1975 Addition to single duct variable volume reheat by installing variable volume boxes with reheat coils in the present ductwork and variable frequency drives on the air handling units and return/relief fans along with converting air handling unit S-7 from 100 percent outside air to minimum outside air and replacing the outside air dampers on all air handling units with low leakage dampers and all chilled water coil three-way valves with two-way valves.

Also included in this project is to modify the supply air fans A6-1, A6-2, B6-1, B6-2, B2-1, B2-2 and CB-1 in the 1955 Building with fixed pitch vane axial fans and variable frequency drives.

The 1975 Addition part of this project will result in less gas energy used by the single duct variable volume reheat system since the terminal coils only heat the space minimum air flow required, the outside air quantities have been reduced and the old chilled water valves are replaced with new valves. Less electrical energy will be used by the reduction of the fan air flow quantity and reduction of the refrigeration load in response to the space load diversity.

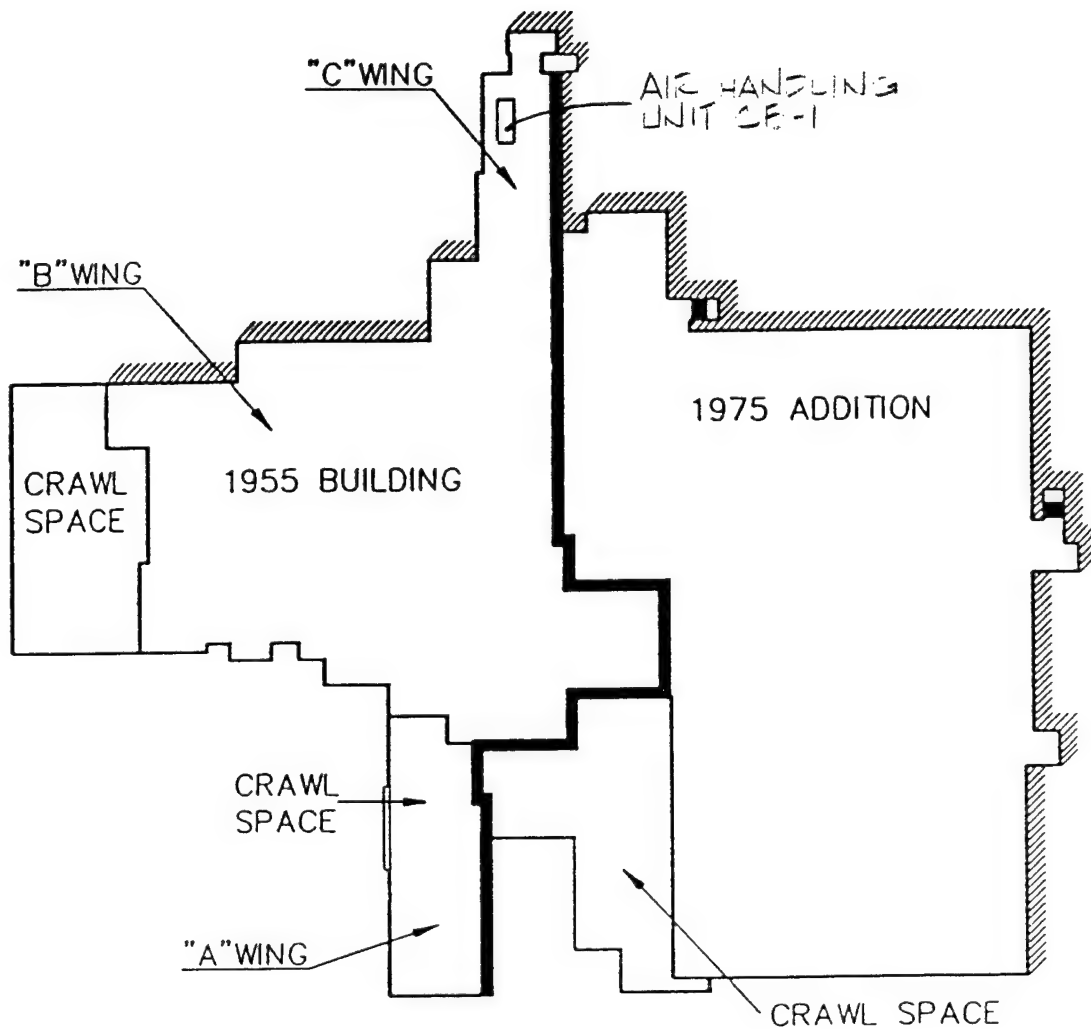
The 1955 Building part of this project will result in more efficient air flow control for the variable volume units and less maintenance cost. Less gas and electrical energy will be consumed for air flow conditioning due to improved air flow control.

functional requirements summary, PDB-1

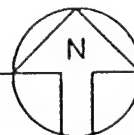


THIRD FLOOR PLAN

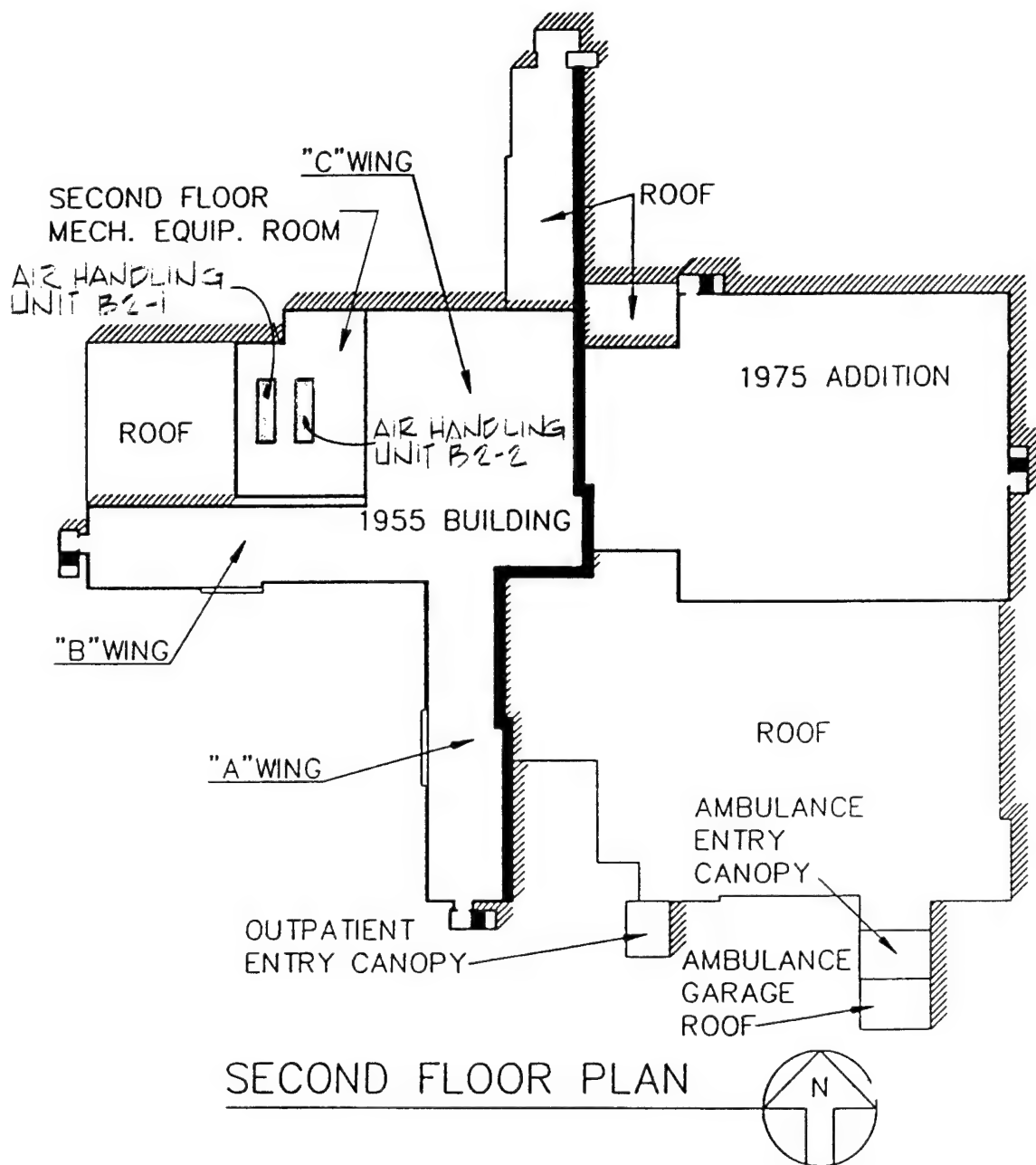
facilities requirements sketch, PDB- 1/2



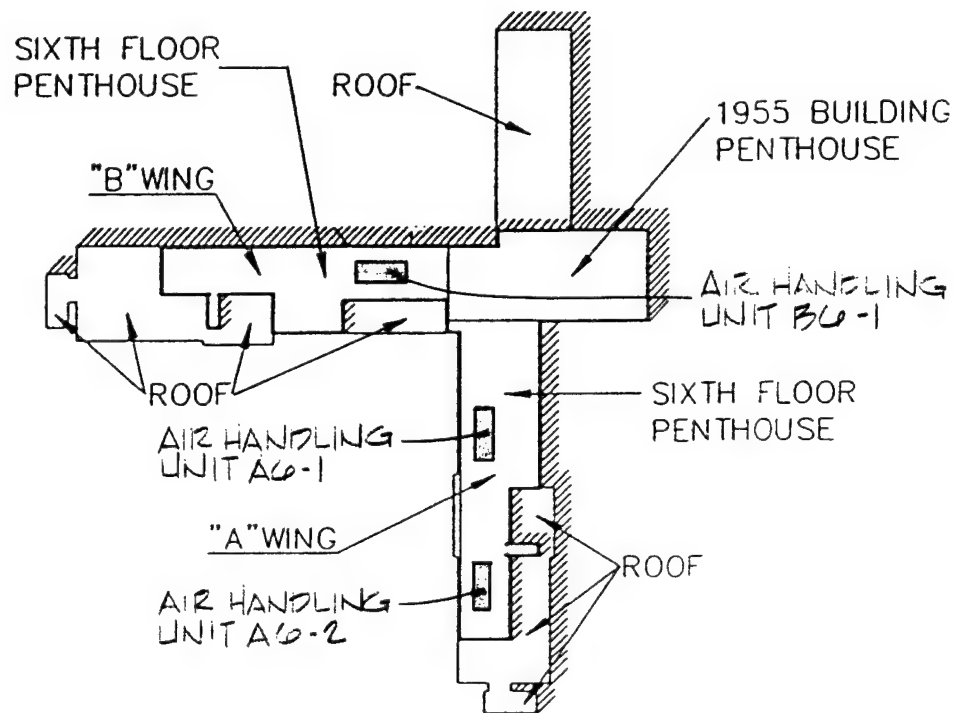
BASEMENT FLOOR PLAN



facilities requirements sketch, PDB- 1/2



facilities requirements sketch, PDB- 1/2



SIXTH FLOOR PLAN



facilities requirements sketch, PDB- 1/2

A. SPECIAL CONSIDERATIONS

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
A-1	Cost estimates for each primary and supporting facility	R			
A-2	Telecommunications system coordination with USACC and authorization for exceptions	NR			✓
A-3	Coordination with state and local governmental requirements (blind vendors, medical facilities, construction and operating permits, clearinghouse coordination, etc.)	NR			
A-4	Assignment of airspace	NR			
A-5	Economic analysis of alternatives	NR			
A-6	Approval for new starts	NR			
A-7	International balance of payments (IBOP) coordination with U.S. European command and NATO—overseas cost estimates and comparables (include rate of exchange used in estimates)	NR			
A-8	Impact on historic places—on site survey by authorized archeologist and coordination with state historic preservation officer and advisory council on historic preservation	NR			
A-9	Exceptions to established criteria	NR			
A-10	Coordination with various staff agencies (Provost Marshall-physical security, etc.)	NR			
A-11	Identification of related or support projects (so projects can be coordinated)	NR			
A-12	Required completion date	NR			
Other Special Considerations (List and number items)		NR			

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently available. Enter code for information source.

COMMENT ATTACHED — Significant information summarized or explained and attached.

DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

*** BY WHOM** (Check and insert appropriate letter)

A — DFAE

B — Using Service

C — Construction Service

D — Designer

E — Other (Check Comments Attached and explain)

documentation checklist

B. SITE DEVELOPMENT

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
B-1	Consultation with the District Office to determine and evaluate flood plain hazards	NR			
B-2	Preparation, submission, and/or approval of new				
(A)	General Site Plan	NR			
(B)	Annotated General Site Plan	NR			
(C)	Sketch Site Plan	NR			
(D)	Facilities Requirements Sketch	NR			
B-3	Preparation of				
(A)	Site Survey	NR			
(B)	Subsoil information	NR			
B-4	Approval by Department of Defense Explosive Safety Board (DDESB) for Safety Site Plan	NR			
	Other Site Development Considerations (List and number items)	NR			

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently available. Enter code for information source.

COMMENT ATTACHED — Significant information summarized or explained and attached.

DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

***BY WHOM** (Check and insert appropriate letter)

A — DFAE

B — Using Service

C — Construction Service

D — Designer

E — Other (Check Comments Attached and explain)

documentation checklist

C. ARCHITECTURAL & STRUCTURAL

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
C-1	Reconciliation with troop housing programs and requirements	NR			
C-2	Evaluation of existing facilities (including degree of utilization)	NR			
C-3	Approval for removal and relocation of existing useable facilities	NR			
C-4	Evaluation of off-post community facilities	NR			
C-5	Storage and maintenance facilities (including nuclear weapons)	NR			
C-6	Coordination hospitals, medical and dental facilities with Surgeon General	NR			
C-7	Coordination of aviation facilities with FAA	NR			
C-8	Coordination air traffic control and navigational aids with USACC	NR			
C-9	Tabulation of types and numbers of aircraft	NR			
C-10	Evaluation of laboratory, research and development, and technical maintenance facilities	NR			
C-11	Coordination chapels with Chief of Chaplains	NR			
C-12	Review food service facilities by USATSA	NR			
C-13	Automated data processing system or equipment approvals—cost analysis when ADP and/or communication centers not co-located with related facilities	NR			
C-14	Coordination postal facilities with U.S. Postal Service Regional Director	NR			
C-15	Laundry and dry cleaning facilities coordination with ASD(I&L)	NR			
C-16	Tenant facilities coordination with installation where sited	NR			
C-17	Facilities for or exposed to explosions, toxic chemicals, or ammunition—review by DDESB (See also Item B-4)	NR			
C-18	Analysis of deficiencies	NR			
C-19	Consideration of alternatives	NR			
C-20	Determination whether occupants will include physically handicapped or disabled persons	NR			
C-21	As-build drawings for alterations or additions	NR	A		
C-22	Availability of Standard Design or site adaptable designs	NR			
	Other Architectural & Structural (List and number items)	NR			

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

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COMMENT ATTACHED — Significant information summarized or explained and attached.

DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

***BY WHOM** (Check and insert appropriate letter)

A — DFAE

B — Using Service

C — Construction Service

D — Designer

E — Other (Check Comments Attached and explain)

documentation checklist

D. MECHANICAL, ELECTRICAL, & UTILITY SYSTEMS

ITEM		Requ Not R	To Be Determ	Comm Attac	Docur Attac
D-1	Fuel considerations and cost comparison analysis	NE			
D-2	Energy requirements appraisal (ERA)	NE			
D-3	Conformance with DOD Energy Reduction requirements	NE			
D-4	Evaluation of existing and/or proposed utility systems	NE			
	Other Mechanical and Utility Systems (List and number items)	NE			

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documentation checklist

DA FORM 5023-D-R, Feb 82

E. ENVIRONMENTAL CONSIDERATIONS

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
E-1	Environmental impact assessment	NR	NR		
E-2	EIA conclusions require Environmental Impact Statement	NR			
E-3	Determination of health, environmental or related hazards. Assistance to determine existence of any health, environmental or related hazard may be requested from Aberdeen Proving Ground, MD 21010, the Office of the Surgeon General, Attn: DASG-HCH (Army Environmental Hygiene Agency)				
E-4	Air/water pollution permit, coordination with agencies and compliance with standards at Federal, state and local level	NR			
E-5	Corrective measures associated with Environmental Impact Statements or assessment—list separately and evaluate.	NR			
	Other environmental considerations (list and number items)	NR			

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documentation checklist

DA FORM 5023-E-R, Feb 82

A. SPECIAL CONSIDERATIONS

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
A-1	Factors of risk, restriction or unusual circumstance expected to increase costs beyond applicable area averages	NR			
A-2	Construction phasing requirements				
A-3	Functional support equipment (mechanical, electrical, structural, and security) to be built in	NR			
A-4	Equipment in place and justification	NR			
A-5	Other equipment and furniture (O&MA, OPA) and costs	NR			
A-6	Special studies and tests (hazards analyses, compatibility testing, new technology testing, etc.)	NR			
A-7	Type of construction (permanent, temporary, semi-permanent)	NR			
A-8	Government furnished equipment (quantities, procurement time, availability and special handling and storage requirements). Funds used for procurement.	NR			
	Other special considerations (list and number items)	NR			

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technical data checklist

B. SITE DEVELOPMENT

ITEM		Required or Not Required	To Be Determined	Comment Attached	Document Attached
B-1	Construction restrictions or guidelines pertaining to site access and preferred construction routes	NR			
(A)					
(B)	Airfield clearance, explosive storage, working hours, safety, etc.	NR			
(C)	Facilities and/or functions or adjoining areas (structures, materials, impact)	NR			
B-2	Real estate actions (acquisition, disposal, lease, right-of-way)	NR			
B-3	Demolition/relocation required (data)				
(A)	Special considerations due to explosives/radioactivity/chemical contamination/asbestos emissions/toxic gases	NR			
(B)	Restrictions on disposal of demolished/relocated material including hazardous waste	NR			
B-4	Pavement types and requirements (including traffic surveys and MTMC coordination)	NR			
B-5	Landscape considerations				
(A)	Protection of existing vegetation	NR			
(B)	Stockpile topsoil	NR			
	Other Site Development (List and number items)	NR			

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technical data checklist

C. ARCHITECTURAL & STRUCTURAL

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
C-1	Vibration-producing equipment requiring isolation	NR			
C-2	Seismic zone and other design load criteria (typhoon, hurricane, earthquake loads, high or low loss potential)	R	D		
C-3	Protective shelter evaluation and resistant design criteria (conventional/nuclear blast and radiation, chemical/biological)	NR			
C-4	Unusual foundation requirements (pier, pile, caisson, deep foundations, mat, special treatment, permafrost areas, soil bearing)	NR			
C-5	Designation and strength of units to be accommodated	NR			
C-6	Requirements and data for special design projects	NR			
C-7	Unusual floor and roof loads (safes, equipment)	NR			
C-8	Security features (arms rooms, vaults, interior secure areas)	NR			
	Other Architectural & Structural (List and number items)	NR			

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technical data checklist

D. MECHANICAL, ELECTRICAL, & UTILITY SYSTEMS

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
D-1	Special mechanical requirements or considerations (elevator, crane, hoist, etc.)	NR			
D-2	Special peak usage periods and peak leveling techniques	NR			
D-3	Maintenance considerations (accessibility of equipment, compatibility with existing equipment)	R	D		
D-4	Plumbing—availability, general system type and characteristics (proposed and/or existing, incl. compressed air and gas)	R	D		
D-5	Heating—availability, general system type and characteristics (proposed and/or existing)	R	D		
D-6	Ventilating, air condition/refrigeration—availability, general system type and characteristics (proposed and/or existing)	R	D		
D-7	Electrical—availability, general system type and characteristics incl. airfield lighting, communication, etc. (proposed and/or existing)	R	D		
D-8	Water supply/waste treatment—availability, general system type and characteristics (proposed and/or existing)	NR			
D-9	Energy requirements/fuel conversion (sources, availability, loads, types of fuel, etc.)	NR			
D-10	Solar energy evaluation	NR			
	Other Mechanical & Utility Systems (List and number items)	NR			

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E. ENVIRONMENTAL CONSIDERATIONS

ITEM		Required or Not Required	* To Be Determined	Comment Attached	Document Attached
E-1	Waste water treatment, air quality, and solid waste disposal criteria Other Environmental Considerations (List and number items)	NR NR			

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technical data checklist

COST ESTIMATE ANALYSIS										INVOITATION/CONTRACTOR		EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 5-800-2; the proponent agency is USACE.										CODE (Check one) <input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C		January 1992		January 1992	
PROJECT Irwin Army Community Hospital - EEAP										DRAWING NO. HVAC SYSTEM MOD.		SHEET 1 OF 4 SHEETS			
LOCATION Fort Riley, Kansas										ESTIMATOR KLAB		CHECKED BY R. D. Frymire			
TASK DESCRIPTION	QUANTITY		MH	LABOR		EQUIPMENT		MATERIAL		TOTAL	SHIPPING				
	NO. OF UNITS	UNIT MEAS		UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST		UNIT WT	TOTAL WT			
SHEET 2 OF 4										288,265					
SHEET 3 OF 4										144,300					
SHEET 4 OF 4										96,900					
SUBTOTAL										529,465					
SUBCONTRACTOR OH @ 15%										79,420					
SUBCONTRACTOR PROFIT @ 10%										66,889					
SUBTOTAL										669,774					
GEN. CONTRACTOR OH @ 15%										100,466					
GEN. CONTRACTOR PROFIT @ 10%										77,024					
SUBTOTAL										847,264					
CONTINGENCIES @ 5.5%										46,600					
CONSTRUCTION COST BASED ON MEANS 1992 COST.										893,864					
SIOH @ 6%										53,632					
TOTAL THIS SHEET										947,496					

COST ESTIMATE ANALYSIS										EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 5-900-2; the proponent agency is USACE.										January 1992		January 1992	
PROJECT		INVOITATION/CONTRACTOR		CODE (Check one)		DRAWING NO.		SHEET		OF		SHEETS	
Irwin Army Community Hospital - EEAP		<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C		HVAC SYSTEM MOD.		ESTIMATOR		CHECKED BY		R. D. Frymire			
LOCATION		LABOR		EQUIPMENT		MATERIAL		TOTAL		UNIT WT		SHIPPING	
Fort Riley, Kansas		MH		TOTAL HRS		UNIT PRICE		COST		UNIT PRICE		COST	
TASK DESCRIPTION		NO. OF UNITS		UNIT MEAS		EA		LS		EA		LS	
REPLACE O.A. DAMPERS													
INCLUDING OPERATORS													
ON 6 AHU'S IN 1975													
BLDG (344 TOTAL)	1	LS				2000	—	100	—	6420	8520		
REPLACE CHW 3-WAY													
VALVES W/ 2-WAY	6	EA				116.66	700	2.33	14	816.66	5614		
REPLACE REHEAT COILS													
WITH VAV BOXES W/													
REHEAT	431	EA				1000	43,100	1	431	500	215,500	259,031	
TEMP CONTROLS	1	LS				—	10,000	—	100	—	5000	15,100	
TOTAL THIS SHEET											280,265		

COST ESTIMATE ANALYSIS										INVIATION/CONTRACTOR		EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 5-800-2; the proponent agency is USACE.												January 1992		January 1992	
PROJECT		Irwin Army Community Hospital - EEAP		CODE (Check one)		<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C		DRAWING NO.		HYAC SYSTEM MOD.		SHEET 3 OF 4 SHEETS			
LOCATION		Fort Riley, Kansas		OTHER		<input type="checkbox"/>		ESTIMATOR		WAB		CHECKED BY R. D. Frymire			
TASK DESCRIPTION	QUANTITY		MH	TOTAL HRS	LABOR		EQUIPMENT		MATERIAL		TOTAL	SHIPPING			
	NO. OF UNITS	UNIT MEAS			UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST		UNIT WT	TOTAL WT		
FURNISH & INSTALL															
VARIABLE FREQ. DRIVES															
1975 ADDITION HVAC															
50 HP	5	EA	—	—	1000	5000	100	500	19000	95,000	100,500				
30 HP	1	EA	—	—	1000	1000	100	100	12000	12,000	13,100				
15 HP	2	EA	—	—	1000	2000	100	200	6000	12,000	14,200				
10 HP	2	EA	—	—	1000	2000	100	200	4000	8000	12,200				
7 1/2 HP	1	EA	—	—	1000	1000	100	100	3000	3000	4,100				
MODIFY 1955 BUDG															
VANE AXIAL FAN															
ROTOR	11	EA	—	—	100	1100	—	—	100	1100	2200				
TOTAL THIS SHEET											144,300				

3. BOILER CONTROL

1. COMPONENT ARMY	FY 19 <u>95</u> MILITARY CONSTRUCTION PROJECT DATA			2. DATE 19 APR 1992 14 APR 1992
3. INSTALLATION AND LOCATION Fort Riley Kansas		4. PROJECT TITLE ECIP Boiler Controls		
5. PROGRAM ELEMENT	6. CATEGORY CODE 510 10	7. PROJECT NUMBER 40478	8. PROJECT COST (\$000) 250	
9. COST ESTIMATES				
ITEM	U/M	QUANTITY	UNIT COST	COST (\$000)
PRIMARY FACILITY				205
Energy Plant Mod b-615	BD	1	204,523	(205)
SUPPORTING FACILITIES				12
Design Cost	LS	---	---	(12)
ESTIMATED CONTRACT COST				217
CONTINGENCY PERCENT (10.0%)				22
SUBTOTAL				239
SUPERVISION, INSPECTION & OVERHEAD (6.00%)				14
CATEGORY E EQUIPMENT				(0)
TOTAL REQUEST				253
TOTAL REQUEST (ROUNDED)				250
INSTALLED EQUIPMENT-OTHER APPROPRIATIONS				(0)
10. DESCRIPTION OF PROPOSED CONSTRUCTION The project includes modifications to the boiler controls and boiler stack accessories. Replace the existing induced draft and forced draft fan inlet vanes with variable frequency drives. Install economizers in the flue stacks to recover waste heat, install a boiler management system to reduce man-hours required to operate the boiler and upgrade the building combustion controls. The heat recovered by the stack economizer is used to preheat boiler feed water.				
11. REQUIREMENT: PROJECT: Install four new variable frequency motor drives. Install two stack economizers with associated piping and valves. Install a boiler management system. Install new oxygen trim controls. REQUIREMENT: This project is required to reduce the gas consumption caused by low boiler efficiencies.				

1. COMPONENT ARMY	FY 19 <u>95</u> MILITARY CONSTRUCTION PROJECT DATA		2. DATE 19 APR 1992 14 APR 1992												
3. INSTALLATION AND LOCATION Fort Riley Kansas															
4. PROJECT TITLE ECIP Boiler Controls		5. PROJECT NUMBER 40478													
<p>CURRENT SITUTATION:</p> <p>The existing 34,000 lbs/hr boilers utilize induced draft and forced draft fans with inlet vane control. The user has indicated they have trouble maintaining control of the furnace pressure. The boilers have no waste heat recovery systems at this time. By installing a stack economizer less gas input is required to make steam. The boilers are operated manually which requires an operator to be close by 24 hours a day. The current oxygen trim system is in poor condition and cannot control excess air to the boilers resulting in a lower boiler system efficiency.</p> <p>IMPACT IF NOT PROVIDED:</p> <p>Failure to approve this project will continue the excess energy being used to generate steam that is used for hospital systems, HVAC systems, and domestic hot water generation.</p> <p>ADDITIONAL:</p> <p>This project complies with the scope and design of CEHSU-FU-M, Energy Conservation Investment Program (ECIP) Guidance, that was in effect June 1991. The project has a Discounted Savings Ratio (SIR) of 4.05 and a simple payback of 4.0 years. The implementation of this project will provide an annual energy savings of 5,845 MBTU and an annual dollar savings of \$56,797.</p> <p>Project validation will be through metering of electric and gas consumption at the Energy Plant along with boiler operating logs and engineering calculations will be used to verify the effectiveness of the project.</p> <table border="0"> <tr> <td>ESTIMATED CONSTRUCTION START:</td> <td>APR 1995</td> <td>INDEX:</td> <td>1992</td> </tr> <tr> <td>ESTIMATED MIDPOINT OF CONSTRUCTION:</td> <td>OCT 1995</td> <td>INDEX:</td> <td>2029</td> </tr> <tr> <td>ESTIMATED CONSTRUCTION COMPLETION:</td> <td>APR 1996</td> <td>INDEX:</td> <td>2055</td> </tr> </table>				ESTIMATED CONSTRUCTION START:	APR 1995	INDEX:	1992	ESTIMATED MIDPOINT OF CONSTRUCTION:	OCT 1995	INDEX:	2029	ESTIMATED CONSTRUCTION COMPLETION:	APR 1996	INDEX:	2055
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ESTIMATED CONSTRUCTION COMPLETION:	APR 1996	INDEX:	2055												

1. COMPONENT ARMY	FY 19 <u>95</u> MILITARY CONSTRUCTION PROJECT DATA	2. DATE April 1992
3. INSTALLATION AND LOCATION Irwin Army Community Hospital Fort Riley, Kansas		
4. PROJECT TITLE Boiler Controls (ECIP)	5. PROJECT NUMBER	
<div data-bbox="310 474 1284 1434"> <p>The diagram is a floor plan of an energy plant. It shows a complex layout of rooms and corridors. In the upper right, there are three circular tanks. Below them, a central corridor runs vertically. To the left of this corridor are several rooms, some containing equipment. To the right of the corridor are two large rectangular units labeled 'EXISTING BOILERS' with arrows pointing to them. At the bottom of the plan, there are more rooms and a series of small rectangular units on the left. A north arrow is located in the bottom right corner of the plan area.</p> </div> <div data-bbox="261 1570 1029 1623"> <p>ENERGY PLANT FLOOR PLAN</p> </div> <div data-bbox="1078 1558 1224 1705"> </div>		

1. COMPONENT ARMY	FY 19₉₅ MILITARY CONSTRUCTION PROJECT DATA	2. DATE April 1992
3. INSTALLATION AND LOCATION Irwin Army Community Hospital Fort Riley, Kansas		
4. PROJECT TITLE Boiler Controls (ECIP)		5. PROJECT NUMBER
<p style="text-align: center;"><u>BOILER PLANT ELEVATION</u></p>		

LIFE CYCLE COST ANALYSIS SUMMARY

ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: Fort Riley, Ks. REGION NO.: 7 PROJECT NO.: 40478
 PROJECT TITLE: Boiler Controls FISCAL YR.: 1995
 DISCRETE PORTION NAME: Boiler Controls
 ANALYSIS DATE: 4-15-92 ECONOMIC LIFE 25 YEARS PREPARED BY: RDF

1. INVESTMENT

A. CONSTRUCTION COST	\$	203130
B. SIOH	\$	12188
C. DESIGN COST	\$	12188
D. SALVAGE VALUE	-	\$ 0
E. TOTAL INVESTMENT (1A + 1B + 1C - 1D)		\$ 227506

2. ENERGY SAVINGS (+) / COST (-)

ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	COST \$/MBTU/YR(1)	SAVINGS MBTU/YR(2)	ANNUAL \$ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	\$ 11.13	108	\$ 1198	15.04	\$ 18012
B. DIST	\$		\$		\$
C. RESID	\$		\$		\$
D. NG	\$ 3.59	5738	\$ 20599	18.92	\$ 389741
E. COAL	\$		\$		\$
F. TOTAL		5846	\$ 21797		\$ 407753

3. NONENERGY SAVINGS(+) / COST (-)

A. ANNUAL RECURRING (+/-)
 (1) DISCOUNT FACTOR (TABLE A) 14.68
 (2) DISCOUNTED SAVING/COST (3A X 3A1) \$ 513800

B. NONRECURRING SAVINGS (+) / COST (-)

ITEM	SAVINGS(+) COST(-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR(3)	DISCOUNTED SAVINGS (+) COST (-) (4)
(1)	\$			\$
(2)	\$			\$
(3)	\$			\$
(4) TOTAL	\$			\$

C. TOTAL NONENERGY DISCOUNTED SAVINGS (+) / COST (-) (3A2 + 3BD4) \$ 513800

D. PROJECT NONENERGY QUALIFICATION TEST

(1) 25% MAX NONENERGY CALC (2F5 X .33) \$ 134558
 a. IF 3D1 IS = OR > 3C GO TO ITEM 4
 b. IF 3D1 IS < 3C CALC $S1R = (2F5 + 3D1) / 1E =$ 2.38
 c. IF 3D1b IS = > 1 GO TO ITEM 4
 d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS $2F3 + 3A + (3B1d / \text{YEARS ECONOMIC LIFE})$ \$ 56797

5. TOTAL NET DISCOUNTED SAVINGS (2F5 + 3C) \$ 921553

6. DISCOUNTED SAVINGS RATIO (IF < 1 PROJECT DOES NOT QUALIFY) (SIR) = $(5 / 1E) =$ 4.05

7. SIMPLE PAYBACK PERIOD (ESTIMATED YEARS) $SPB = 1E/4$ 4.01

INTRODUCTION

This project concerns implementing several modifications to the existing boilers and their operation. Four items are recommended. The first is the installation of variable frequency drives to replace the inlet vanes on the two existing induced draft fans at the top of the boiler stacks. The existing fan controls do not operate correctly and are not as efficient as other methods of air flow control. The second item suggested is the installation of a boiler management controller in the boiler plant for automatic start up and monitoring. While this system does not necessarily save much energy it does save non-energy dollars by eliminating one full-time boiler operator. The third item addressed is the installation of a boiler stack economizer in each boiler stack to preheat feed water using waste energy from the boiler stacks. This reduces the amount of gas input to the boiler required to heat the feed water. The fourth item included in this package is the replacement of the existing oxygen trim controls. The existing oxygen trim analyzing equipment has failed. This results in wasted energy and lower boiler system efficiency.

Manual calculations based on system profiles generated by TRACE and information from the user were performed to determined energy savings.

ASSUMED CONDITIONS

Gas Cost = 3.7 \$ / MCF

Electric Cost = 0.038 \$ / KWH

Maintenance Costs will not increase

One Boiler is Standby

0.746 KW / HP

ELECTRICAL ENERGY CAN BE SAVED BY INSTALLING VARIABLE FREQUENCY DRIVE CONTROL ON THE INDUCED DRAFT BOILER FANS. THE FANS ARE NOW CONTROLLED BY INLET VANES. THE SYSTEM HEATING LOAD PROFILE IS USED TO DETERMINE THE PERCENT OF AIR VOLUME REQUIRED. IT IS ASSUMED THAT COMBUSTION AIR PERCENTAGE FOLLOWS THE HEATING LOAD. THE PROFILE WAS GENERATED USING THE TRANE "TRACE" PROGRAM. THERE IS ONE 15 HP INDUCED DRAFT FAN PER BOILER. SINCE ONE BOILER IS STANDBY THE COST FOR INSTALLING VARIABLE FREQUENCY DRIVES ON BOTH BOILER FANS IS INCLUDED BUT THE SAVINGS FOR ONLY ONE IS INCLUDED. THE DRIVES WILL BE CONTROLLED BY INTERNAL BOILER PRESSURE SENSORS.

DIFFERENCE IN ENERGY USE

INLET VANES	$1 \times 38,482$	$= 38,482$
VARIABLE SPEED MOTOR	$1 \times 6,963$	$= 6,963$
		$31,519 \text{ KWH}$

ANNUAL ENERGY SAVING

$$31,519 \text{ KWH} \times 3413 \text{ BTU/KWH} = 107.6 \times 10^6 \text{ BTU/YR}$$

ANNUAL DOLLAR SAVING

$$31,519 \text{ KWH} \times 0.038 \text{ \$/KWH} = 1198 \text{ \$/YR}$$

VARIABLE SPEED MOTOR CONTROL

INDUCED DRAFT FANS | @ 15 HP

<u>% DESIGN LOAD</u>	<u>DESIGN POWER FRACTION</u>	<u>FULL LOAD POWER HP</u>	<u>HOURS</u>	<u>0.746 KW/HP</u>	<u>= KWH</u>
5	.05	15	3599	.746	2014
10	.05	15	699	.746	391
15	.05	15	902	.746	505
20	.05	15	826	.746	462
25	.09	15	678	.746	683
30	.10	15	608	.746	680
35	.14	15	430	.746	674
40	.20	15	298	.746	667
45	.25	15	317	.746	887
50	0	0	0		0
55					
60					
65					
70					
75					
80					
85					
90					
95					
100					

TOTAL

6,963 KWH

INLET VANE CONTROL

INDUCED DRAFT FANS 1@ 15 HP

<u>% DESIGN LOAD</u>	<u>DESIGN POWER FRACTION</u>	<u>FULL LOAD POWER HP</u>	<u>HOURS x 0.746 KW/HP</u>	<u>= KWH</u>
2	.40	15	3,599	= 16,109
12	.40	15	699	= 3,129
15	.40	15	902	= 4,037
20	.40	15	820	= 4,037
25	.41	15	678	= 3,111
30	.42	15	608	= 2,857
35	.43	15	430	= 2,069
40	.45	15	298	= 1,501
45	.40	15	317	= 1,632
50	0	0	0	= 0
55				
60				
65				
70				
75				
80				
85				
90				
95				
100				
TOTAL				38,482 KWH

SIMULATING SECONDARY SYSTEMS

Secondary system models mathematically relate the rate of heating and/or cooling energy delivery, e.g., hot and/or chilled water, to space sensible loads. Usually, such models are formulated to receive the space sensible loads as input, and allow calculation of heating and/or cooling rates at the coils. (Also see the discussion Overall Modeling Strategies later in this chapter.)

Fundamental Relations for Moist Air

The underlying principles for secondary system models are primarily those for mass and energy balances on moist air described in Chapter 6. For example, Equation (46) from Chapter 6 gives the relationship between space sensible heat gain, space moisture addition, supply airflow rate, and air enthalpy change from supply to exhaust conditions. Similarly, Equation (44) then relates input and output enthalpies and flow rates of mixing boxes, and Equation (40) the heating requirements at a coil to its inlet and outlet enthalpies. Equations (41) and (42) relate air mass flows, enthalpies, and moisture-removal rates for cooling-dehumidifying coils. [These particular equations must be augmented, however, with some type of model representing moisture removal and sensible cooling capability of the physical cooling coil, as discussed in Chapter 5, Equations (65) through (67).]

Since secondary systems are composed of mixing boxes, cooling coils, heating coils, and fans interconnected in various ways, mathematical models can be developed by assembling the applicable equations. For example, all mass and energy balance equations for a variable air volume terminal reheat system can be developed into an algorithm in which airflow rate, cooling coil energy rate, and reheating energy rate are calculated, given a particular required space sensible load on one or more service zones.

Models for Fans

A complete secondary system also requires a mathematical model for supply and return fans for two reasons: the required fan power must be calculated, since fan energy usage is an important factor and most, if not all, of the fan power is ultimately degraded to heat in the airstream, adding to cooling coil loads or reducing heating coil loads, depending on the fan location.

Computation of fan power is usually based on a characteristic curve, giving fraction of rated input power versus fraction of rated volume. This curve is determined principally by the method used to control air volume (see Figure 7). These curves can be determined experimentally or obtained from the manufacturer, although those shown in the figure often are accurate enough for energy analysis. Rated power can be calculated from rated volumetric flow rate, pressure rise, and efficiency as:

$$\text{Fan horsepower} = \frac{Q \Delta p}{6370 \eta_F \eta_M} \quad (45)$$

where

Q = air volumetric flow, cfm
 Δp = fan total pressure rise, in. of water
 η_F = fan efficiency
 η_M = motor efficiency

Most models assume that some fraction of the fan motor power goes directly into heating (i.e., enthalpy rise) of the air as it passes through the fan. The fraction is 1.0 if the fan motor is mounted in the airstream, and 1.0 minus motor efficiency η_M if mounted outside. The increase in air enthalpy occurs immediately downstream of the fan.

Modeling of System Controls

From a mathematical viewpoint, system control devices represent equations that must be satisfied at each point during the

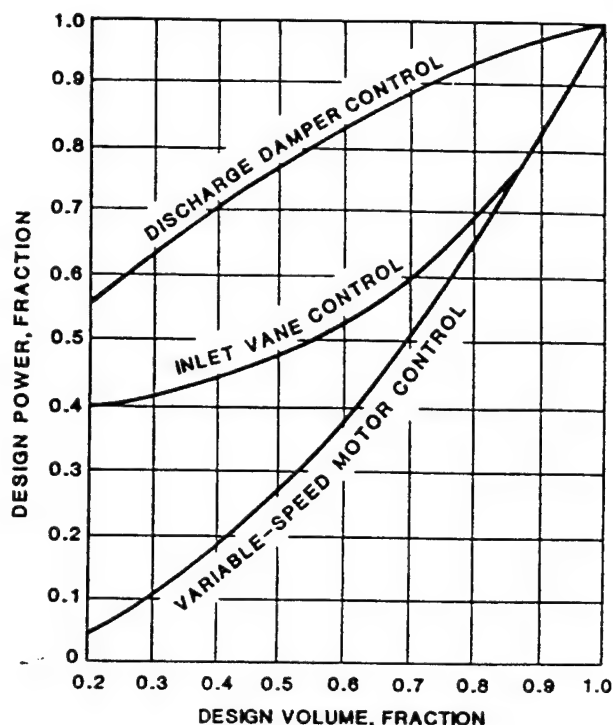


Fig. 7 Fan Power Versus Volume Characteristics

simulation and those that model other system components. For example, the room thermostat can be represented as a function relating heating and cooling delivery rate to space temperature, as shown in Figure 6. Similarly, cooling coil reset controls can be modeled as a relationship between outside or zone temperature and coil discharge temperature. An accurate secondary system model must ensure that all controls are properly represented and that the governing equations are satisfied at each simulation time step. This usually creates a need for iteration or, alternately, for use of values from an earlier solution point.

The controls on space temperature affect the interaction between loads calculation and secondary system simulation (see Figure 5). A realistic model might require a dead band in space temperature (Figure 6), in which no heating or cooling is called for; within this range, the true space sensible load is zero, and the true space temperature must be adjusted accordingly. If the thermostat has proportional control between zero and full capacity (i.e., over a throttling range), the space temperature will rise in proportion to the load during cooling and fall similarly during heating. Capacity to heat or cool also varies with space temperature after the control device has reached its maximum because capacity is proportional to the difference between supply and space temperatures. Failure to properly model these phenomena results in overestimating required energy.

Integration of System Models

To demonstrate the approach to system modeling, the variable air volume (VAV) system serving three zones is shown in Figure 8. For simplicity, the following assumptions are made: (1) the space temperatures, sensible loads, and latent loads have been previously determined by the heat balance method; (2) the loads are within the capacities of the respective heating and/or cooling equipment; (3) the fan is a variable volume unit with the fraction of nominal power expressible by a second-order polynomial in fraction of nominal volume; (4) the cooling coil discharge temperature is scheduled linearly with the temperature of the warmest zone; and (5) the outside air quantity is fixed.

SYSTEM TOTALS LOAD PROFILE - ALTERNATIVE 1
EXISTING SYSTEMS

----- SYSTEM LOAD PROFILE -----

System Totals

Percent Design Load	---- Cooling Load ----			----- Heating Load -----			---- Cooling Airflow ----			---- Heating Airflow ----		
	Cap. (Ton)	Hours (%)	Hours	Capacity (Btuh)	Hours (%)	Hours	Cap. (Cfm)	Hours (%)	Hours	Cap. (Cfm)	Hours (%)	Hours
0 - 5	62.9	50	4,385	-890,475	43	3,599	17,334.2	0	0	0.0	0	0
5 - 10	125.8	0	0	-1,780,949	8	699	34,668.5	0	0	0.0	0	0
10 - 15	188.7	5	405	-2,671,424	11	902	52,002.7	0	0	0.0	0	0
15 - 20	251.6	9	757	-3,561,899	10	826	69,336.9	0	0	0.0	0	0
20 - 25	314.5	3	273	-4,452,373	8	678	86,671.2	0	0	0.0	0	0
25 - 30	377.4	4	382	-5,342,848	7	608	104,005.4	0	0	0.0	0	0
30 - 35	440.3	6	537	-6,233,322	5	430	121,339.6	0	0	0.0	0	0
35 - 40	503.2	5	417	-7,123,798	4	298	138,673.9	0	0	0.0	0	0
40 - 45	566.1	4	349	-8,014,272	4	317	156,008.1	0	0	0.0	0	0
45 - 50	629.0	4	323	-8,904,748	0	0	173,342.3	0	0	0.0	0	0
50 - 55	691.9	2	196	-9,795,222	0	0	190,676.6	0	0	0.0	0	0
55 - 60	754.8	3	264	-10,685,697	0	0	208,010.8	0	0	0.0	0	0
60 - 65	817.7	2	171	-11,576,172	0	0	225,345.0	0	0	0.0	0	0
65 - 70	880.6	1	109	-12,466,646	0	0	242,679.3	0	0	0.0	0	0
70 - 75	943.5	2	172	-13,357,121	0	0	260,013.5	57	4,985	0.0	0	0
75 - 80	1,006.4	0	20	-14,247,597	0	0	277,347.7	22	1,939	0.0	0	0
80 - 85	1,069.3	0	0	-15,138,071	0	0	294,682.0	9	784	0.0	0	0
85 - 90	1,132.2	0	0	-16,028,546	0	0	312,016.2	2	196	0.0	0	0
90 - 95	1,195.1	0	0	-16,919,022	0	0	329,350.4	2	216	0.0	0	0
95 - 100	1,258.0	0	0	-17,809,496	0	0	346,684.7	7	640	0.0	0	0
Hours Off	0.0	0	0	0	0	403	0.0	0	0	0.0	0	8,760

t

COST ESTIMATE ANALYSIS										INVOITATION/CONTRACTOR		EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 8-800-2; the proponent agency is USACE.										MARCH 1992		MARCH 18, 1992			
PROJECT IRWIN ARMY COMMUNITY HOSPITAL - EEAP										CODE (Check one) <input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C		DRAWING NO.		SHEET OF SHEETS	
LOCATION FORT RILEY, KANSAS										<input type="checkbox"/> OTHER		ESTIMATOR WAB		CHECKED BY R. D. FRYMIRE	
TASK DESCRIPTION	QUANTITY		MH	TOTAL HRS	LABOR		EQUIPMENT		MATERIAL		TOTAL	SHIPPING			
	NO. OF UNITS	UNIT MEAS			UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST		UNIT WT	TOTAL WT		
15 HP VARIABLE	2	EA			315	630			500	10,000	10,630				
FREQUENCY DRIVE															
CONTRACTOR OH	15%										1595				
" PROFIT	10%										1063				
CONSTRUCTION COST											13,288				
SION 6%											797				
TOTAL THIS SHEET											14085				

BOILER MANAGEMENT CONTROLLER

PER RECOMMENDATIONS BY USA CERL INSTALL A BOILER MANAGEMENT SYSTEM IN THE ENERGY PLANT FOR AUTOMATIC BOILER CONTROL, SWITCHOVER AND MONITORING. THE SYSTEM WOULD BE INTERFACED WITH THE EXISTING EMCS SYSTEM. BY INSTALLING A BOILER MANAGEMENT SYSTEM ONE FULL TIME OPERATOR WOULD BE ELIMINATED.

BASED ON COST FIGURES FROM THE USER THE NON ENERGY ANNUAL RECURRING SAVINGS IS \$30,000 PLUS BENEFITS.

IN ORDER TO INTERFACE WITH THE EXISTING EMCS SYSTEM WIRING AND POINT PROGRAMMING IS REQUIRED.

ANNUAL DOLLAR SAVINGS - NON ENERGY
 $30,000 + 5000 = \$35,000 / \text{YR}$

COST ESTIMATE ANALYSIS										INVIATION/CONTRACTOR		EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 5-800-2; the proponent agency is USACE.										MARCH 1992		MARCH 18, 1992			
PROJECT IRWIN ARMY COMMUNITY HOSPITAL - EEAP										CODE (Check one) <input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C		DRAWING NO.		SHEET OF SHEETS	
LOCATION FORT RILEY, KANSAS										<input type="checkbox"/> OTHER		ESTIMATOR WAB		CHECKED BY R. D. FRYMIRE	
TASK DESCRIPTION	QUANTITY		MH	TOTAL HRS	LABOR		EQUIPMENT		MATERIAL		TOTAL	SHIPPING			
	NO. OF UNITS	UNIT MEAS			UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST		UNIT WT	TOTAL WT		
COMPUTERIZED BOILER	1	EA			3000	3000			10000	10,000	13,000				
MANAGEMENT SYSTEM															
WIRING & PROGRAMMING	9	EA			500	4500			200	1800	6300				
POINT FUNCTIONS															
SUBTOTAL											19,300				
CONTRACTOR OH	15%										2895				
" PROFIT	10%										1930				
CONTINGENCY	5.5%										24,125				
CONSTRUCTION COST											1327				
											25,452				
SI OH	6%										1527				
TOTAL THIS SHEET											26,979				

BOILER STACK ECONOMIZER

INSTALL A BOILER STACK ECONOMIZER IN EACH OF THE TWO BOILER STACKS. THE STACK ECONOMIZERS WILL BE USED TO PREHEAT THE BOILER FEEDWATER FROM 225°F TO 286°F DEPENDING ON THE LOAD. EACH BOILER HAS A CAPACITY OF 33,500 MBH.

FLUE GAS TEMPERATURES WERE TAKEN FROM BOILER LOG SHEETS PROVIDED BY THE ENERGY PLANT OPERATING PERSONNEL. SAVINGS ARE CALCULATED BASED ON THE FLUE GAS EXIT TEMPERATURES AND THE MINIMUM STACK TEMPERATURE OF 240 °F REQUIRED TO PREVENT CONDENSATION IN THE STACK.

BOILER BASELOAD OPERATION IS ADDED AS A CONSTANT LOAD TO THE HEATING SYSTEM BOILER LOAD. THE BASELOAD, CONSISTING OF DOMESTIC HOT WATER, STERILIZERS AND KITCHEN EQUIPMENT IS ESTIMATED AT 7445 lb/hr

THE BOILER ANNUAL OPERATION AT PARTIAL LOAD IS REFLECTED BY THE "SYSTEM LOAD PROFILE TOTALS" OUTPUT REPORT FROM THE TRACE 600 RUNS OF THE EXISTING BUILDINGS SERVED BY THE ENERGY PLANT

THE PRIMARY BOILER AND IDENTICAL STANDBY BOILER ARE USED ALTERNATELY. THE SAVINGS ARE THEREFORE CALCULATED BASED ON THE OPERATION OF 1 BOILER BUT THE COST OF BOTH ECONOMIZERS IS INCLUDED.

THE BOILER STACK ECONOMIZER HAS AN
AUTOMATIC SOOT BLOWER AND NO OTHER
COMPONENTS REQUIRING SCHEDULED
MAINTENANCE THEREFORE NO MAINTENANCE
COST DIFFERENCE IS TAKEN INTO ACCOUNT.

HR YR	HEATING LOAD MBH	BASELOAD MBH	TOTAL BOILER LOAD	% OF BOILER CAPACITY	HEAT RECOVERY BTUH $\times 10^3$	SAVINGS BTU $\times 10^3$
267	975	7445	8420	25	300	801.00
148	1000	7445	8445	25	300	44,400
130	1025	7445	8470	25	300	39,000
213	1050	7445	8495	25	300	63,900
103	1075	7445	8520	25	300	30,900
108	1100	7445	8545	26	320	34,560
169	1125	7445	8570	26	320	54,080
71	1150	7445	8595	26	320	22,720
145	1175	7445	8620	26	320	46,400
146	1200	7445	8645	26	320	46,720
155	1225	7445	8670	26	320	49,600
62	1250	7445	8695	26	320	19,840
165	950	7445	8395	25	300	49,500
394	996	7445	8441	25	300	118,200
600	1041.6	7445	8486.6	25	300	180,000
456	1087.4	7445	8532.4	25	300	136,800
25	1133	7445	8578	26	320	8,000
267	2037.4	7445	9482.4	28	360	96,120
177	2083.2	7445	9528.4	28	360	63,720
217	2129	7445	9574	29	370	80,290
815	2713.2	7445	10158.2	30	375	305,625
676	3617.6	7445	11062.6	33	440	297,440
578	4522	7445	11967	36	460	265,880
858	5426.3	7445	12871.3	38	510	437,580
473	6330.7	7445	13775.7	41	550	260,150
221	7235.1	7445	14680.1	44	605	133,705
301	8139.5	7445	15584.5	47	660	198,660
93	9044	7445	16489	49	700	65,100
TOTAL						3,228,990

ANNUAL ENERGY SAVINGS

$$\begin{aligned} 3229 \times 10^6 \text{ BTU} \div 1.03 \times 10^6 \text{ BTU/MCF} &= 3132 \text{ MCF} \\ &= 3229 \times 10^6 \text{ BTU/4R} \end{aligned}$$

ANNUAL DOLLAR SAVING

$$3132 \text{ MCF} \times 3.7 \text{ \$/MCF} = 11,588 \text{ \$/4R}$$

SENT BY:

4-22-91 10:45AM ; DIVISION FINTUBE-

NOP

CUSTOMER

saglia-Newstrom-Bredson

PROPOSAL 322-10380-0-0

RUN 00

KENTURE
4150 S. ELWOOD
TULSA, OKLAHOMAPRINTED 04/19/91
TIME 16 HRS 48 MINS
CUST. REFERENCE
H. Army Hospital
IRWIN

CYLINDRICAL FUEL ECONOMIZER

MODEL 511240

OVERALL PERFORMANCE

COUNTER CURRENT FLOW

FLUID CIRCULATED IN TUBES IS WATER

HEAT EXCHANGED 1841181. BTU/HR

U EXTERNAL 5.646 BTU/HR-SQFT-F

LMTD 143.5 DEG F

BOILER STACK ECONOMIZER

OVERALL CONSTRUCTION

VERTICAL GAS FLOW

DIMENSIONS

DIM A (HEIGHT) 8'-3/4"

DIM B (NOZ C-C) 5'-1 1/4"

DIM C (DIAMETER) 5'-0 1/2"

DRAWING NO V-6

SOOT BLOWERS ARE BUILT IN

NOZZLE SIZE 4.0 IN

SURFACE AREA 2273. SQF

LIQUID WEIGHT 604. LB

UNIT WEIGHT (DRY) 6577. LB

PERFORMANCE SPECIFICATIONS

TUBE SIDE GAS SIDE

↓

↑

	TUBE SIDE	GAS SIDE	
FLOW RATE	23000.	27485.	LB/HR
TEMP IN	225.0	550.0	DEG F
TEMP OUT	304.0	299.4	DEG F
PRES IN	400.0 PSIG	14.7	PSIA
PRES DROP* (.8)	8.8 PSI	.45	IN WATER

CONSTRUCTION SPECIFICATIONS

TUBE SIDE

DESIGN PRESSURE	175.	PSI
TEST PRESSURE	263.	PSI
DESIGN TEMPERATURE	700.	DEG
TUBE OUTSIDE DIA	2.000	IN
MATERIAL	C/SIL	
FIN THICKNESS	.060	IN
PITCH	4.00	FIN
MATERIAL	C/SIL	
INSULATION		
MATERIAL	MINERAL WO	
THICKNESS	2.0	IN

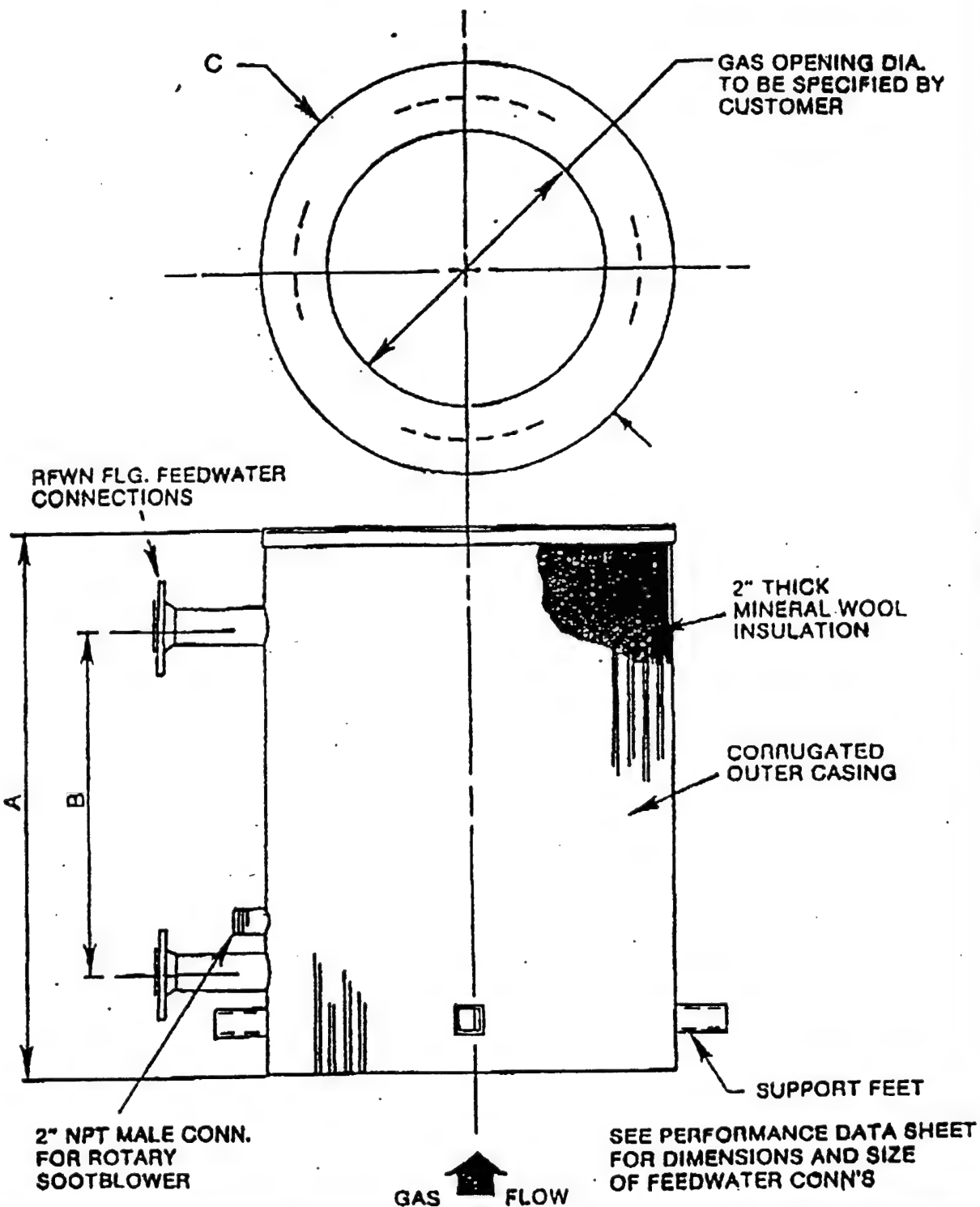
PARTIAL LOAD EVALUATION

TEMPERATURES
(DEG. F)PRESSURE
DROPTOTAL
FLUID
CIRCULATED
(LBS/HR)HEAT
TRANSFER

NUMBER	TUBE.....SHELL		TUBE.....SHELL		TUBE.....SHELL	TUBE.....SHELL	BTU/HR
	INLET..OUTLET	INLET..OUTLET	(PSI)	(W.G.)			
65% 1	225.0	286.4	441.0	266.8	3.7	.2	→ 15000. 17925. 93031
30% 2	225.0	276.0	403.0	244.0	.9	.1	→ 7300. 8724. 37545

Kentube cylindrical Fuel economizer

BOILER STACK ECONOMIZER



SYSTEM TOTALS LOAD PROFILE - ALTERNATIVE 1

----- SYSTEM LOAD PROFILE -----

HOSPITAL

System Totals

Percent Design Load	----- Cooling Load -----			----- Heating Load -----			----- Cooling Airflow -----			----- Heating Airflow -----		
	Cap. (Ton)	Hours (%)	Hours	Capacity (Btuh)	Hours (%)	Hours	Cap. (Cfm)	Hours (%)	Hours	Cap. (Cfm)	Hours (%)	Hours
0 - 5	62.4	26	1,560	-904,391	43	3,599	17,345.3	0	0	0.0	0	0
5 - 10	124.8	0	0	-1,808,782	9	743	34,690.7	0	0	0.0	0	0
10 - 15	187.1	7	405	-2,713,174	10	815	52,036.0	0	0	0.0	0	0
15 - 20	249.5	12	713	-3,617,565	8	676	69,381.3	0	0	0.0	0	0
20 - 25	311.9	6	347	-4,521,956	7	578	86,726.6	0	0	0.0	0	0
25 - 30	374.3	6	382	-5,426,347	10	858	104,072.0	0	0	0.0	0	0
30 - 35	436.7	7	445	-6,330,738	6	473	121,417.3	0	0	0.0	0	0
35 - 40	499.1	8	479	-7,235,130	3	221	138,762.6	0	0	0.0	0	0
40 - 45	561.4	6	333	-8,139,521	4	301	156,108.0	0	0	0.0	0	0
45 - 50	623.8	6	330	-9,043,913	1	93	173,453.3	0	0	0.0	0	0
50 - 55	686.2	4	225	-9,948,304	0	0	190,798.6	0	0	0.0	0	0
55 - 60	748.6	4	244	-10,852,696	0	0	208,143.9	0	0	0.0	0	0
60 - 65	811.0	3	151	-11,757,088	0	0	225,489.3	0	0	0.0	0	0
65 - 70	873.3	2	129	-12,661,477	0	0	242,834.6	0	0	0.0	0	0
70 - 75	935.7	3	192	-13,565,869	0	0	260,179.9	57	4,954	0.0	0	0
75 - 80	998.1	0	0	-14,470,261	0	0	277,525.3	22	1,970	0.0	0	0
80 - 85	1,060.5	0	0	-15,374,653	0	0	294,870.6	9	792	0.0	0	0
85 - 90	1,122.9	0	0	-16,279,044	0	0	312,215.9	2	188	0.0	0	0
90 - 95	1,185.2	0	0	-17,183,436	0	0	329,561.2	2	216	0.0	0	0
95 - 100	1,247.6	0	0	-18,087,826	0	0	346,906.6	7	640	0.0	0	0
Hours Off	0.0	0	2,825	0	0	403	0.0	0	0	0.0	0	8,760

SYSTEM TOTALS LOAD PROFILE - ALTERNATIVE 1
 TING SYSTEMS

SYSTEM LOAD PROFILE

NURSE QUARTERS

System Totals

Percent Design Load	Cooling Load			Heating Load			Cooling Airflow			Heating Airflow		
	Cap. (Ton)	Hours (%)	Hours	Capacity (Btu/h)	Hours (%)	Hours	Cap. (Cfm)	Hours (%)	Hours	Cap. (Cfm)	Hours (%)	Hours
0 - 5	5.4	12	337	-45,749	47	1,882	1,926.4	0	0	0.0	0	0
5 - 10	10.7	8	245	-91,497	10	394	3,852.8	0	0	0.0	0	0
10 - 15	16.1	11	321	-137,246	15	600	5,779.2	0	0	0.0	0	0
15 - 20	21.5	9	262	-182,994	11	456	7,705.6	0	0	0.0	0	0
20 - 25	26.8	3	91	-228,743	7	292	9,632.0	0	0	0.0	0	0
25 - 30	32.2	9	276	-274,492	4	177	11,558.4	0	0	0.0	0	0
30 - 35	37.6	4	122	-320,240	5	217	13,484.8	0	0	0.0	0	0
35 - 40	43.0	5	155	-365,989	0	0	15,411.2	0	0	0.0	0	0
40 - 45	48.3	10	303	-411,738	0	0	17,337.6	0	0	0.0	0	0
45 - 50	53.7	2	60	-457,486	0	0	19,264.0	0	0	0.0	0	0
50 - 55	59.1	5	154	-503,235	0	0	21,190.4	0	0	0.0	0	0
55 - 60	64.4	5	154	-548,983	0	0	23,116.8	0	0	0.0	0	0
60 - 65	69.8	3	91	-594,732	0	0	25,043.1	0	0	0.0	0	0
65 - 70	75.2	3	92	-640,481	0	0	26,969.5	0	0	0.0	0	0
70 - 75	80.5	4	124	-686,229	0	0	28,895.9	0	0	0.0	0	0
- 80	85.9	3	93	-731,978	0	0	30,822.3	0	0	0.0	0	0
- 85	91.3	1	31	-777,726	0	0	32,748.7	0	0	0.0	0	0
- 90	96.6	0	0	-823,475	0	0	34,675.1	0	0	0.0	0	0
90 - 95	102.0	0	0	-869,224	0	0	36,601.5	0	0	0.0	0	0
95 - 100	107.4	0	0	-914,972	0	0	38,527.9	100	8,760	0.0	0	0
Hours Off	0.0	0	5,849	0	0	4,742	0.0	0	0	0.0	0	8,760

SYSTEM TOTALS LOAD PROFILE - ALTERNATIVE 1
 EXISTING SYSTEMS

SYSTEM LOAD PROFILE

BARRACKS

System Totals

Percent Design Load	Cooling Load			Heating Load			Cooling Airflow			Heating Airflow		
	Cap. (Ton)	Hours (%)	Hours	Capacity (Btuh)	Hours (%)	Hours	Cap. (Cfm)	Hours (%)	Hours	Cap. (Cfm)	Hours (%)	Hours
0 - 5	2.4	12	485	-24,995	16	267	1,498.9	0	0	0.0	0	0
5 - 10	4.9	11	453	-49,989	9	148	2,997.7	0	0	0.0	0	0
10 - 15	7.3	15	621	-74,984	8	130	4,496.6	0	0	0.0	0	0
15 - 20	9.8	8	316	-99,979	12	213	5,995.5	0	0	0.0	0	0
20 - 25	12.2	9	381	-124,974	6	103	7,494.3	0	0	0.0	0	0
25 - 30	14.7	7	273	-149,968	6	108	8,993.2	0	0	0.0	0	0
30 - 35	17.1	5	203	-174,963	10	169	10,492.1	0	0	0.0	0	0
35 - 40	19.6	2	78	-199,958	4	71	11,990.9	0	0	0.0	0	0
40 - 45	22.0	6	246	-224,953	8	145	13,489.8	0	0	0.0	0	0
45 - 50	24.5	3	122	-249,947	9	146	14,988.7	0	0	0.0	0	0
50 - 55	26.9	5	183	-274,942	9	155	16,487.5	0	0	0.0	0	0
55 - 60	29.4	3	122	-299,937	4	62	17,986.4	0	0	0.0	0	0
60 - 65	31.8	6	244	-324,931	0	0	19,485.3	0	0	0.0	0	0
65 - 70	34.3	2	62	-349,926	0	0	20,984.1	0	0	0.0	0	0
70 - 75	36.7	4	153	-374,921	0	0	22,483.0	0	0	0.0	0	0
75 - 80	39.2	2	92	-399,916	0	0	23,981.9	0	0	0.0	0	0
80 - 85	41.6	1	31	-424,910	0	0	25,480.7	0	0	0.0	0	0
85 - 90	44.1	0	0	-449,905	0	0	26,979.6	0	0	0.0	0	0
90 - 95	46.5	0	0	-474,900	0	0	28,478.5	0	0	0.0	0	0
95 - 100	49.0	0	0	-499,894	0	0	29,977.4	100	8,760	0.0	0	0
Hours Off	0.0	0	4,695	0	0	7,043	0.0	0	0	0.0	0	8,760

COST ESTIMATE ANALYSIS										INVOITATION/CONTRACTOR		EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 5-800-2; the proponent agency is USACE.										MARCH 1992		MARCH 18, 1992			
PROJECT IRWIN ARMY COMMUNITY HOSPITAL - EEAP										CODE (Check one) <input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C		DRAWING NO.		SHEET OF SHEETS	
LOCATION FORT RILEY, KANSAS										<input type="checkbox"/> OTHER		ESTIMATOR WAB		CHECKED BY R. D. FRYMIRE	
TASK DESCRIPTION	QUANTITY		MH	LABOR		EQUIPMENT		MATERIAL		SHIPPING					
	NO. OF UNITS	UNIT MEAS		UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	UNIT WT	TOTAL WT				
STACK ECONOMIZER	2	EA		5800	11,600			1771	34,542		46142				
RELIEF VALVE	2	EA						555			1110				
PIPING	LS										3000				
SUBTOTAL											50252				
SUBCONTRACTOR	OH	15%									7538				
"	PROF	10%									5025				
CONTINGENCY		5.5%									62815				
											3455				
CONSTRUCTION COST											66270				
SI OH		6%									3976				
TOTAL THIS SHEET											76,246				

INTRODUCTION

EVALUATE THE ECONOMIC PAYBACK OF INSTALLING THE FIRST ORDER COMBUSTION CONTROLS BY INSTALLING TRIMMABLE CONTROLS.

THE EXISTING BOILERS ARE BARBOCK WOODBURN XIATLY THIS TYPE, BUILT IN 1955, EACH WITH A CAPACITY OF 34,000 LB/HR. COMBUSTION CONTROL FOR THIS TYPE BOILER IS POSITIONING TYPE. THESE POSITIONING CONTROLS RESPOND TO SYSTEM DEMANDS BY MOVING PARALLEL JACKSHAFING WHICH ADJUSTS THE AIR FLOW PROPORTIONALLY TO THE FUEL FLOW.

THE PRIMARY BOILER AND IDENTICAL STANDBY BOILER ARE USED ALTERNATELY. THE SAVINGS ARE THEREFORE CALCULATED BASED ON THE PRICES IN ONE BOILER BUT THE COST OF OC TRIM CONTROLS FOR BOTH BOILERS IS INCLUDED.

FUE GAS TEMPERATURES AND FUEL CONSUMPTION WERE TAKEN FROM BOILER LOG SHEETS PROVIDED BY THE ENERGY PLANT OPERATING PERSONNEL.

MONTH	TOTAL FUEL IN MCF	BOILER NO. 1		BOILER NO. 2	
		AVG STACK TEMP °F	AVG FUEL O ₂	AVG STACK TEMP °F	AVG FUEL O ₂
SEP 89	8793.3	455	3.0	—	—
OCT 89	9499.1	451	3.0	—	—
NOV 89	10446.0	455	3.0	—	—
DEC 89	10443.5	450	3.0	—	—
JAN 90	10433.4	450	7.9	—	—
FEB 90	10435.3	440	3.0	440	3.0
MAR 90	10166.4	431	3.0	441	3.0
APR 90	9500.0	—	—	431	7.9
MAY 90	16150.0	503	7.5	—	—
JUNE 90	17080.0	509	7.9	—	—
JULY 90	15973.6	500	7.9	—	—
AUG 90	5000.0	501	3.0	459	7.9

TOTAL = 147,798.3 MCF

TOTAL ANNUAL ENERGY CONSUMED IN FISCAL YEAR 1990
 $E = 147,798.3 \text{ MCF} \times 1,031,000 \text{ BTU/MCF}$
 $= 1.5239 \times 10^{11} \text{ BTU}$

ANNUAL ENERGY CONSUMED IN 1990 BY BOILER NO. 1
 $E_B = 147,798.3 \text{ MCF} \times 300.5/365 \times 1,031,000 \text{ BTU/MCF}$
 $= 1.2495 \times 10^{11} \text{ BTU}$

TOTAL ANNUAL ENERGY COST IN FISCAL YEAR 1990
 $A = 147,798.3 \text{ MCF} \times \$3.00/\text{MCF}$
 $= \$473,394.56$

ANNUAL ENERGY COST IN 1990 FOR BOILER NO. 1
 $A_B = 147,798.3 \text{ MCF} \times 300.5/365 \times \$3.00/\text{MCF}$
 $= \$339,377.66$

FUEL GAS COMPOSITION (Vol %) AND HHV
 CO₂ 0.22 N₂ 1.48 CH₄ 92.88 C₂H₆ 4.17 C₃H₈ 0.93 C₄H₁₀ 0.19 C₅H₁₂ .08 HHV 1055 Btu/ft³
 Ambient Air Temperature = 80°F
 Relative Humidity = 60%
 lbs of H₂O/lb of dry air = .013

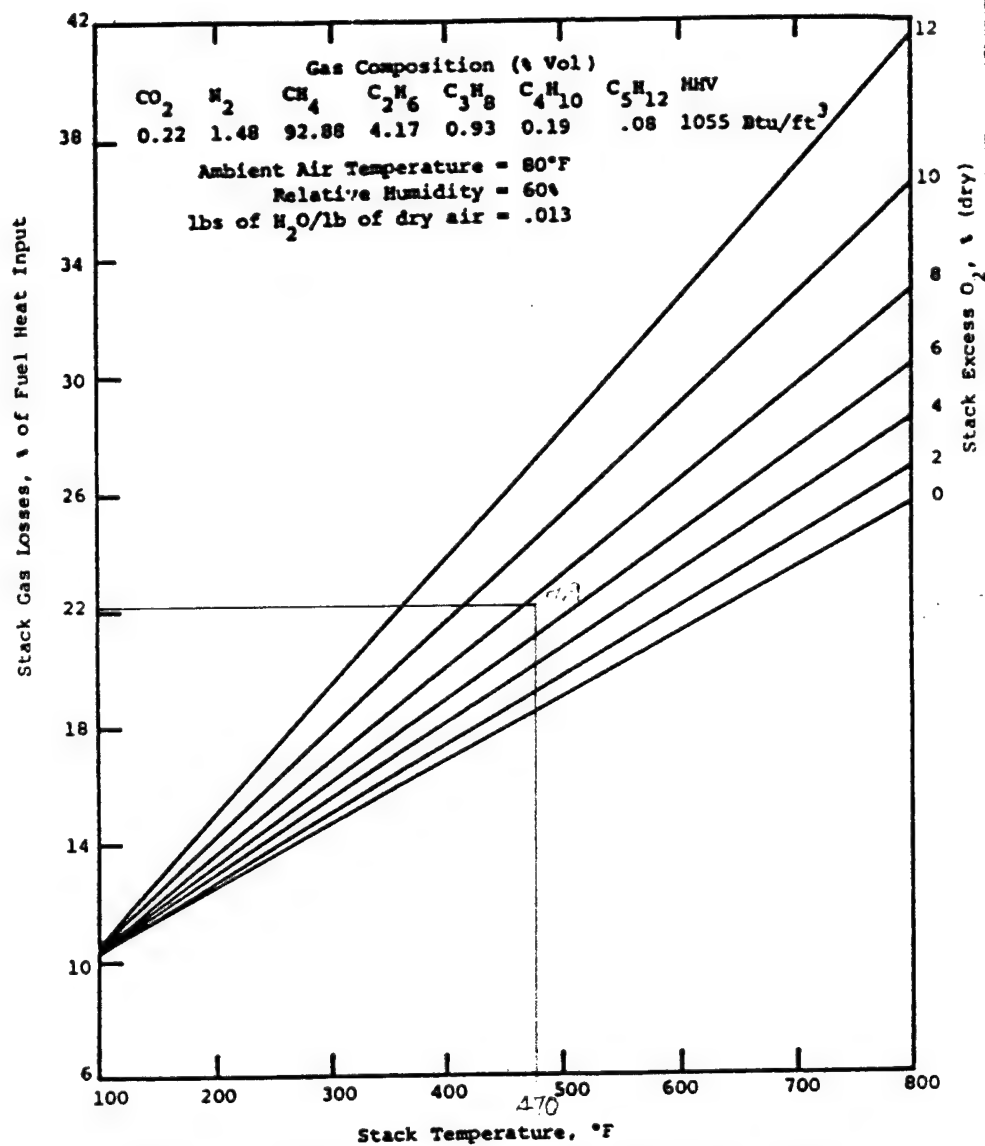


FIGURE 5-1. Stack gas losses (total of dry flue gas plus moisture in air plus moisture in flue gas due to the combustion of hydrogen in the fuel) as a function of stack temperature and excess O₂ for natural gas fuel.

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ANNUAL FUEL LOSS IS EQUAL TO ANNUAL FUEL CONSUMPTION MULTIPLIED BY PERCENT FUEL LOSS.

FROM FIGURE E-1. STACK LOSS = 0.11%
= 0.11%

$$\therefore E_f = 101,680.00 \text{ MCF} \times 0.11\%$$

$$= 11,184.8 \text{ MCF}$$

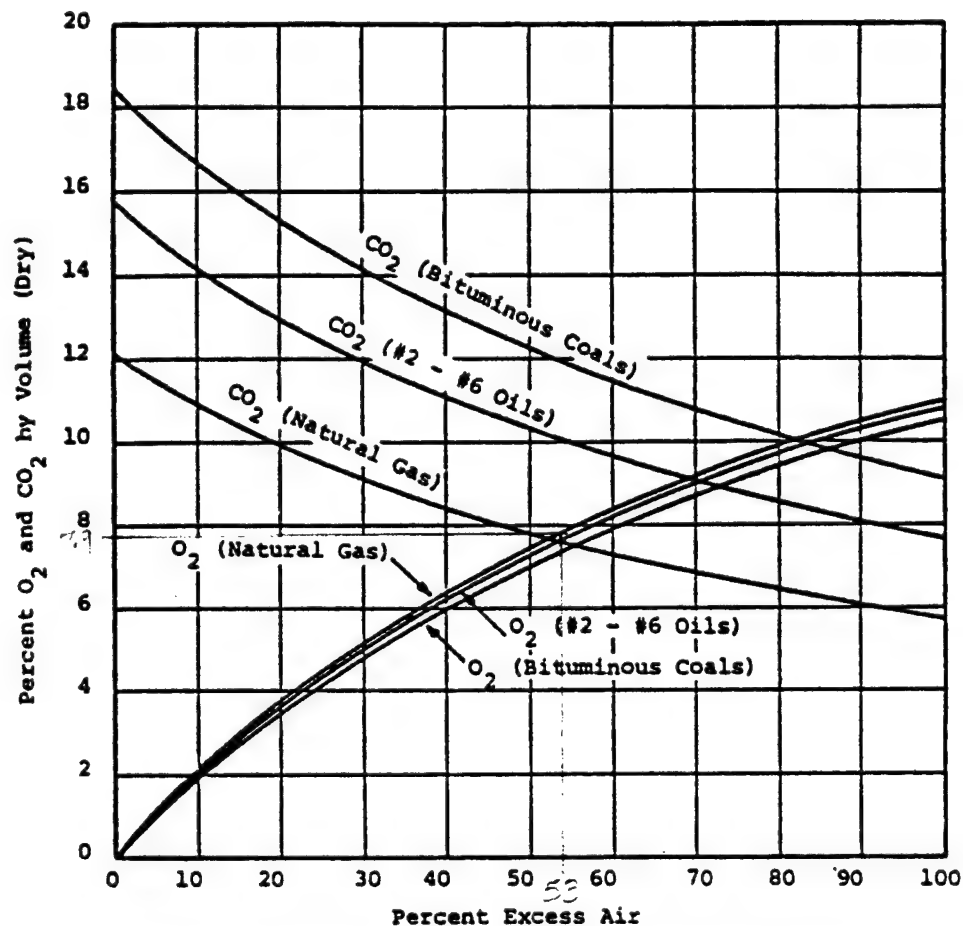


FIGURE 1-1. Relationship between boiler excess air and stack gas concentrations of excess oxygen (O₂) and carbon dioxide (CO₂) for typical fuel compositions.

FROM FIGURE 1-1, EXCESS AIR RANGES FROM 5 TO 10 PERCENT. EXCESS AIR IS ALSO REQUIRED TO BE 5% TO 10% IN. EXCESS AIR REQUIREMENTS FOR NATURAL GAS FIRED BOILERS RANGES FROM 5 TO 10 PERCENT. A DECREASE IN EXCESS AIR WILL RESULT IN A DECREASE IN EXCESS O_2 . MINIMUM EXCESS CO_2 WILL BE THAT AT WHICH THE BOILER JUST STARTS TO SMOKE. FOR THE PURPOSE OF THIS CALCULATION ASSUME COMBUSTION IS CONTROLLED TO 20 PERCENT.

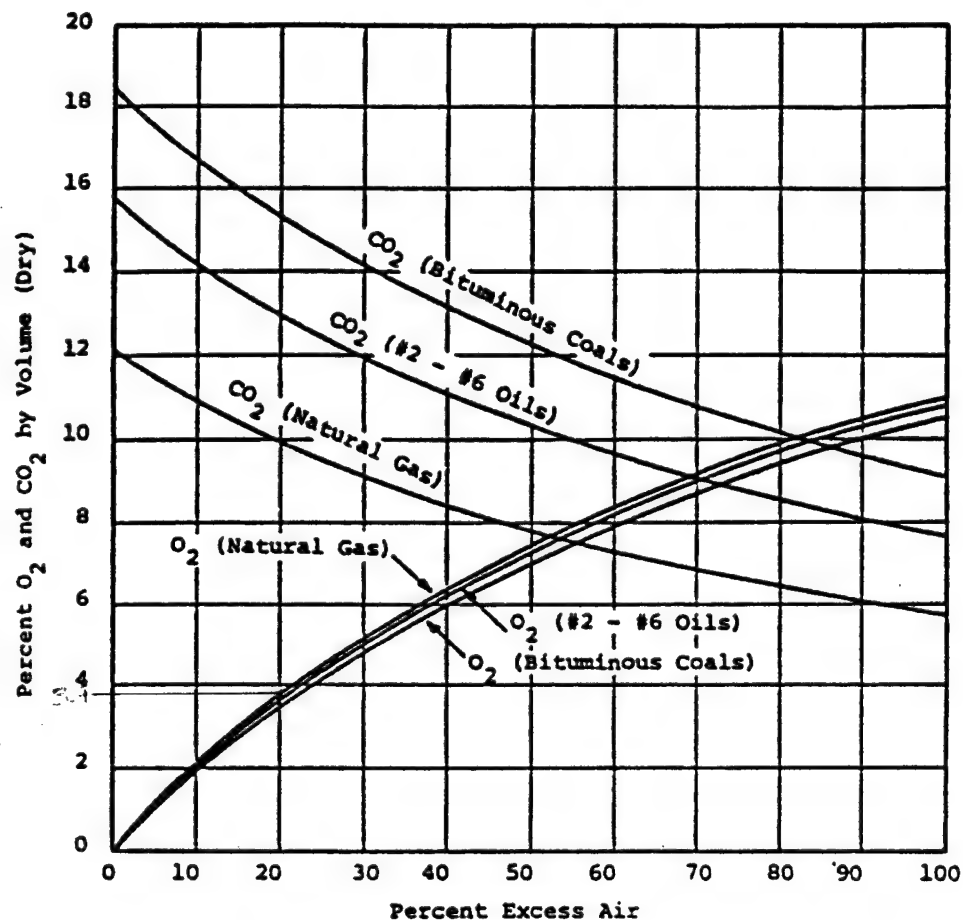


FIGURE 1-1. Relationship between boiler excess air and stack gas concentrations of excess oxygen (O_2) and carbon dioxide (CO_2) for typical fuel compositions.

FROM FIGURE 1-1. 20 PERCENT EXCESS AIR FOR NATURAL GAS YIELDS APPROXIMATELY 3.9 PERCENT EXCESS O_2 . ASSUME A STACK TEMPERATURE OF 470 °F

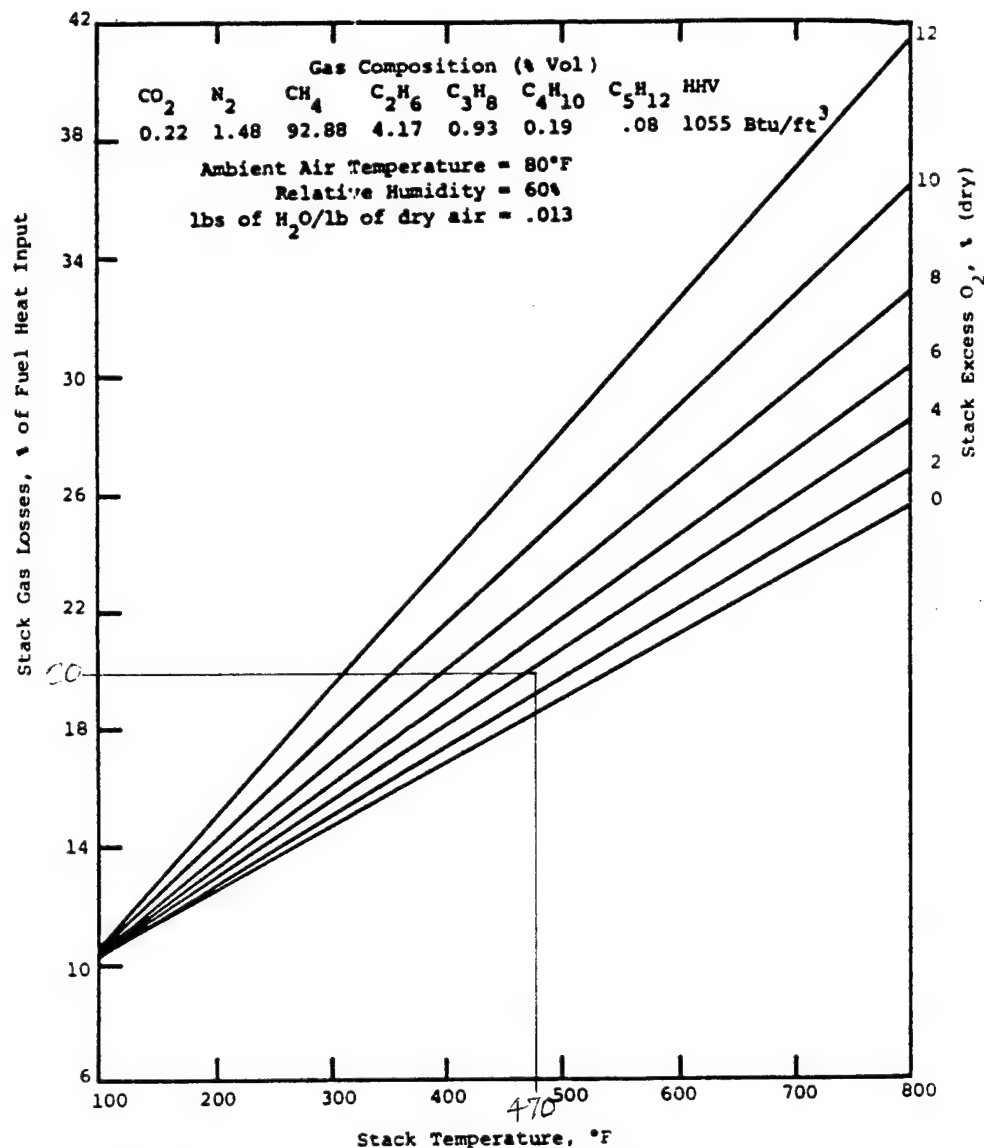


FIGURE 5-1. Stack gas losses (total of dry flue gas plus moisture in air plus moisture in flue gas due to the combustion of hydrogen in the fuel) as a function of stack temperature and excess O_2 for natural gas fuel.

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FROM FIGURE 5-1 THE STACK GAS LOSSES WITH REDUCED EXCESS O_2 IS APPROXIMATELY 20 PERCENT. THEREFORE THE NEW ANNUAL FUEL LOSS EQUALS:

$$\begin{aligned}F_{B1} &= 121,680.52 \text{ MCF} \times 0.20 \\&= 24,336.1 \text{ MCF}\end{aligned}$$

∴ TOTAL ANNUAL FUEL SAVINGS FOR BOILER NO 1 DUE TO O_2 TRIM CONTROL:

$$\begin{aligned}F_T &= F_B - F_{B1} \\&= 26,769.71 - 24,336.1 \\&= 2433.61 \text{ MCF}\end{aligned}$$

∴ TOTAL ANNUAL ENERGY SAVINGS:

$$\begin{aligned}E_T &= 2433.61 \text{ MCF} \times 1,031,000 \text{ BTU/MCF} \\&= 2.509 \times 10^9 \text{ BTU}\end{aligned}$$

∴ TOTAL ANNUAL SAVINGS FOR BOILER NO 1:

$$\begin{aligned}Q_T &= 2433.61 \text{ MCF} \times \$3.20/\text{MCF} \\&= \$7787.55\end{aligned}$$

DUE TO LIMITED OPERATION OF BOILER NO. 2 IN FY 1990 CALCULATIONS WERE NOT COMPLETED.

COST ESTIMATE ANALYSIS				INVOITATION/CONTRACTOR				EFFECTIVE PRICING DATE				DATE PREPARED	
For use of this form, see TM 8-800-2; the proponent agency is USACE.								January 1992				March 1992	
PROJECT				CODE (Check one)				DRAWING NO.				SHEET 1 OF 2 SHEETS	
Irwin Army Community Hospital - EEAP				<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C								CHECKED BY	
LOCATION				<input type="checkbox"/> OTHER				ESTIMATOR				R. D. Frymire	
TASK DESCRIPTION		QUANTITY		MH		LABOR		EQUIPMENT		MATERIAL		SHIPPING	
NO. OF UNITS	UNIT MEAS	UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	TOTAL	UNIT WT	TOTAL WT
SHEET 2 OF 2											30,000		
Sub total											30,000		
Sub Contractor											4,500		
" "											3,000		
Sub total											37,500		
PRIME CONTRACTOR											5,625		
" "											3,750		
Sub total											46,875		
CONTINGENCIES											2,578		
CONSTRUCTION COST											49,453		
SIOH											29,671		
TOTAL THIS SHEET											52,510		

COST ESTIMATE ANALYSIS										EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 8-800-2; the proponent agency is USACE.										January 1992		March 1992	
PROJECT Irwin Army Community Hospital - EEAP										DRAWING NO. _____		SHEET 2 OF 2 SHEETS	
LOCATION Fort Riley, Kansas										ESTIMATOR WBS		CHECKED BY R. D. Frymire	
TASK DESCRIPTION	QUANTITY		MH	LABOR		EQUIPMENT		MATERIAL		TOTAL	SHIPPING		
	NO. OF UNITS	UNIT MEAS		TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT WT		TOTAL WT		
Furnish & Install													
O2 Trim													
Combustion													
System	2	LS								30,000			
TOTAL THIS SHEET										30,000			

SUMMARY OF ANNUAL SAVINGS FOR BOILER MODIFICATIONS

ENERGY SAVING

ELECTRIC

ID FANS

107.6×10^6 BTU/YR

GAS

STACK ECONOMIZER

3229×10^6

OXYGEN TRIM

2509×10^6

5738×10^6 BTU/YR

NON-ENERGY ANNUAL RECURRING

BOILER MANAGEMENT

35,000 \$

installation: IRWIN ARMY COMMUNITY HOSPITAL, FT. RILEY, KANSAS

project: ENERGY ENGINEERING ANALYSIS PROGRAM (EEAP)

project number _____
temporary: _____ program year _____

permanent: _____ category code _____

point of contact:

user
name Maj. James Fletcher date 28 August 1991

title Chief of Logistics phone (913) 239-7207
autovon _____

dfae
name Larry Stillwagon date 20 August 1991

title Base Energy Officer phone (913) 239-2371
autovon _____

engineer district
name Robert Miller date 28 August 1991

title Project Manager phone (816) 426-2782
autovon _____

other (A-E)
name Randall D. Frymire date 27 August 1991

title Project Manager phone (816) 931-2200
autovon _____

reviewed by:

installation facility engineer
name Larry Stillwagon date 28 August 1991

title Base Energy Officer phone (913) 239-2371
autovon _____

approved by:

macom engineer
name _____ date _____

title _____ phone _____
autovon _____

project development brochure, PDB-1

facility

IRWIN ARMY COMMUNITY HOSPITAL
FT. RILEY, KANSAS

project coordinator for using service

LARRY STILLWAGON
BASE ENERGY OFFICER

functional requirements summary, PDB-1

OBJECTIVE

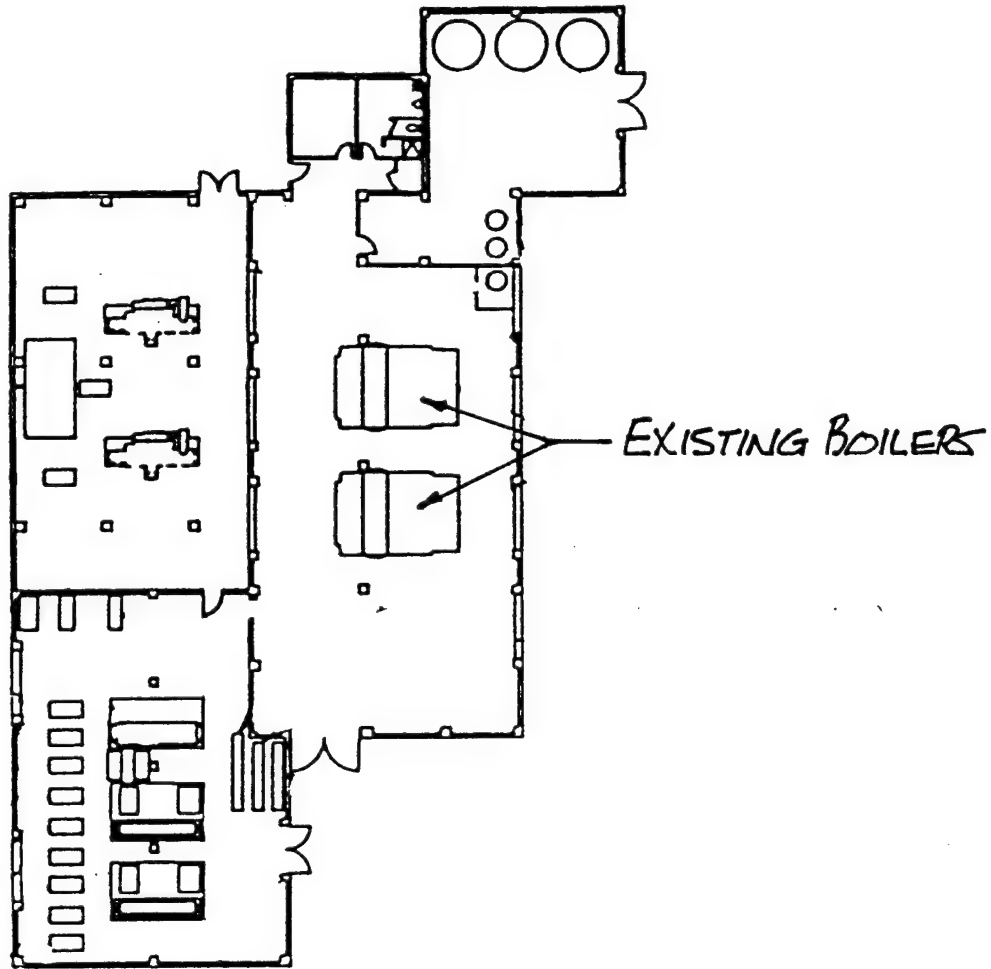
The objectives of this project are as follows:

To install boiler stack fuel economizer on each boiler stack to preheat the feedwater to the boilers and reduce the fuel consumption required to heat the water within the boilers.

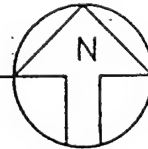
Upgrade the existing boiler combustion and management controls which will result in lower energy consumption and increased boiler efficiency.

Install variable frequency drives on the boiler induced draft fans to save electrical energy and provide better air volume control.

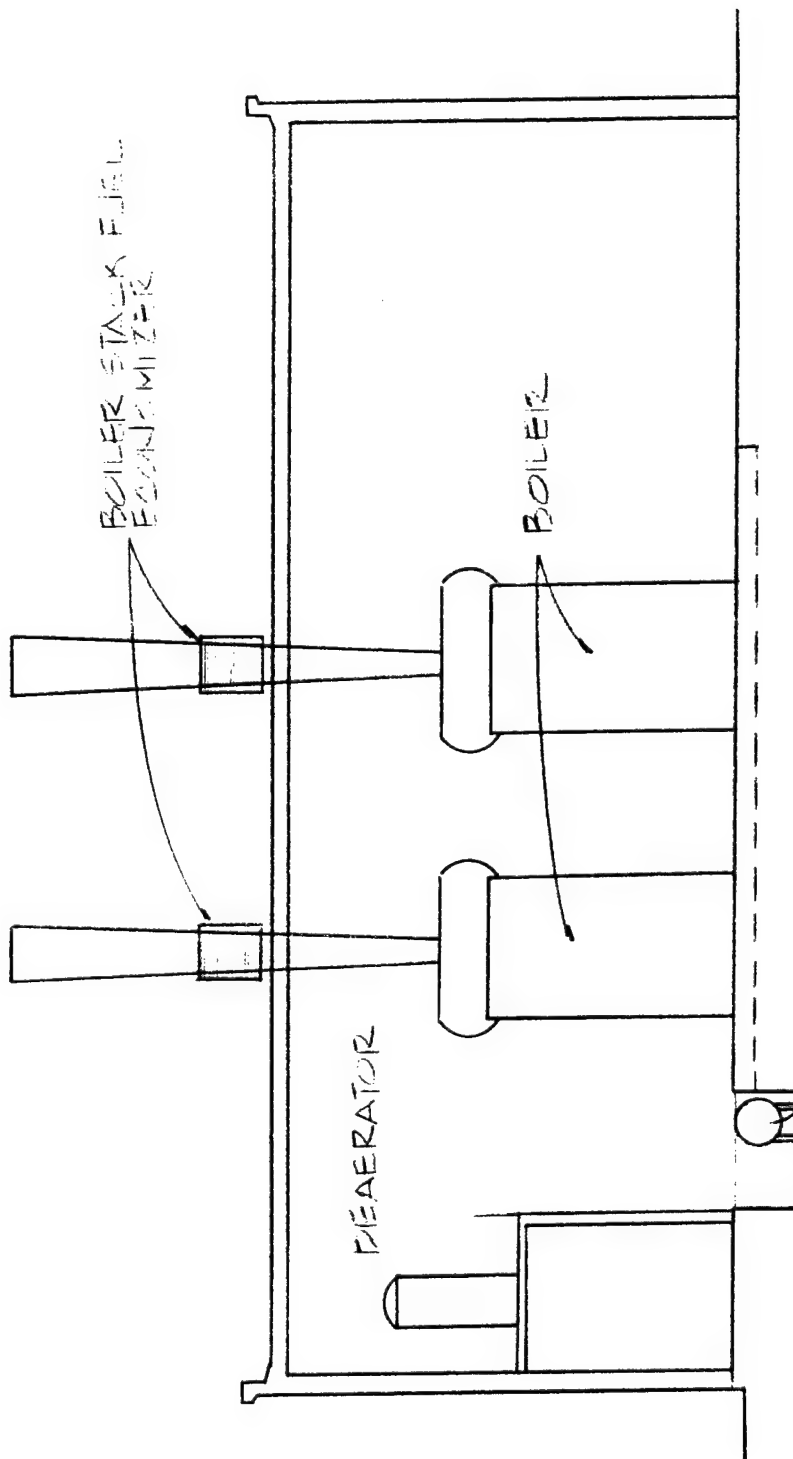
functional requirements summary, PDB-1



ENERGY PLANT FLOOR PLAN



facilities requirements sketch, PDB- 1/2



BOILER PLANT ELEVATION

functional requirements summary, PDB-1

A. SPECIAL CONSIDERATIONS

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
A-1	Cost estimates for each primary and supporting facility	NR			
A-2	Telecommunications system coordination with USACC and authorization for exceptions	NR			
A-3	Coordination with state and local governmental requirements (blind vendors, medical facilities, construction and operating permits, clearinghouse coordination, etc.)	NR			
A-4	Assignment of airspace	NR			
A-5	Economic analysis of alternatives	NR			
A-6	Approval for new starts	NR			
A-7	International balance of payments (IBOP) coordination with U.S. European command and NATO—overseas cost estimates and comparables (include rate of exchange used in estimates)	NR			
A-8	Impact on historic places—on site survey by authorized archeologist and coordination with state historic preservation officer and advisory council on historic preservation	NR			
A-9	Exceptions to established criteria	NR			
A-10	Coordination with various staff agencies (Provost Marshall-physical security, etc.)	NR			
A-11	Identification of related or support projects (so projects can be coordinated)	NR			
A-12	Required completion date	NR			
Other Special Considerations (List and number items)		NR			

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently available. Enter code for information source.

COMMENT ATTACHED — Significant information summarized or explained and attached.

DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

*** BY WHOM** (Check and insert appropriate letter)

A — DFAE

B — Using Service

C — Construction Service

D — Designer

E — Other (Check Comments Attached and explain)

documentation checklist

B. SITE DEVELOPMENT

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
B-1	Consultation with the District Office to determine and evaluate flood plain hazards	NC			
B-2	Preparation, submission, and/or approval of new				
(A)	General Site Plan	NR			
(B)	Annotated General Site Plan	NR			
(C)	Sketch Site Plan	NR			
(D)	Facilities Requirements Sketch	NR			
B-3	Preparation of				
(A)	Site Survey	NR			
(B)	Subsoil information	NR			
B-4	Approval by Department of Defense Explosive Safety Board (DDESB) for Safety Site Plan	NR			
	Other Site Development Considerations (List and number items)	NR			

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

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E — Other (Check Comments Attached and explain)

documentation checklist

C. ARCHITECTURAL & STRUCTURAL

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
C-1	Reconciliation with troop housing programs and requirements	NR			
C-2	Evaluation of existing facilities (including degree of utilization)	NR			
C-3	Approval for removal and relocation of existing useable facilities	NR			
C-4	Evaluation of off-post community facilities	NR			
C-5	Storage and maintenance facilities (including nuclear weapons)	NR			
C-6	Coordination hospitals, medical and dental facilities with Surgeon General	NR			
C-7	Coordination of aviation facilities with FAA	NR			
C-8	Coordination air traffic control and navigational aids with USACC	NR			
C-9	Tabulation of types and numbers of aircraft	NR			
C-10	Evaluation of laboratory, research and development, and technical maintenance facilities	NR			
C-11	Coordination chapels with Chief of Chaplains	NR			
C-12	Review food service facilities by USATSA	NR			
C-13	Automated data processing system or equipment approvals—cost analysis when ADP and/or communication centers not co-located with related facilities	NR			
C-14	Coordination postal facilities with U.S. Postal Service Regional Director	NR			
C-15	Laundry and dry cleaning facilities coordination with ASD(I&L)	NR			
C-16	Tenant facilities coordination with installation where sited	NR			
C-17	Facilities for or exposed to explosions, toxic chemicals, or ammunition—review by DDESB (See also Item B-4)	NR			
C-18	Analysis of deficiencies	NR			
C-19	Consideration of alternatives	NR			
C-20	Determination whether occupants will include physically handicapped or disabled persons	NR			
C-21	As-build drawings for alterations or additions	NR			
C-22	Availability of Standard Design or site adaptable designs	NR			
	Other Architectural & Structural (List and number items)	NR			

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

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- D — Designer
- E — Other (Check Comments Attached and explain)

documentation checklist

E. ENVIRONMENTAL CONSIDERATIONS

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
E-1	Environmental impact assessment	NR			
E-2	EIA conclusions require Environmental Impact Statement	NR			
E-3	Determination of health, environmental or related hazards. Assistance to determine existence of any health, environmental or related hazard may be requested from Aberdeen Proving Ground, MD 21010, the Office of the Surgeon General, Attn: DASG-HCH (Army Environmental Hygiene Agency)	NR			
E-4	Air/water pollution permit, coordination with agencies and compliance with standards at Federal, state and local level	NR			
E-5	Corrective measures associated with Environmental Impact Statements or assessment—list separately and evaluate.	NR			
	Other environmental considerations (list and number items)	NR			

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documentation checklist

A. SPECIAL CONSIDERATIONS

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
A-1	Factors of risk, restriction or unusual circumstance expected to increase costs beyond applicable area averages	NR			
A-2	Construction phasing requirements	NR			
A-3	Functional support equipment (mechanical, electrical, structural, and security) to be built in	NR			
A-4	Equipment in place and justification	NR			
A-5	Other equipment and furniture (O&MA, OPA) and costs	NR			
A-6	Special studies and tests (hazards analyses, compatibility testing, new technology testing, etc.)	NR			
A-7	Type of construction (permanent, temporary, semi-permanent)	NR			
A-8	Government furnished equipment (quantities, procurement time, availability and special handling and storage requirements). Funds used for procurement.	NR			
	Other special considerations (list and number items)	NR			

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- C — Construction Service
- D — Designer
- E — Other (Check Comments Attached and explain)

technical data checklist

B. SITE DEVELOPMENT

ITEM		Required or Not Required	To Be Determined	Comment Attached	Document Attached
B-1	Construction restrictions or guidelines pertaining to site access and preferred construction routes	NR			
(A)					
(B)	Airfield clearance, explosive storage, working hours, safety, etc.	NR			
(C)	Facilities and/or functions or adjoining areas (structures, materials, impact)	NR			
B-2	Real estate actions (acquisition, disposal, lease, right-of-way)	NR			
B-3	Demolition/relocation required (data)				
(A)	Special considerations due to explosives/radioactivity/chemical contamination/asbestos emissions/toxic gases	NR			
(B)	Restrictions on disposal of demolished/relocated material including hazardous waste	NR			
B-4	Pavement types and requirements (including traffic surveys and MTMC coordination)	NR			
B-5	Landscape considerations				
(A)	Protection of existing vegetation	NR			
(B)	Stockpile topsoil	NR			
	Other Site Development (List and number items)	NR			

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E — Other (Check Comments Attached and explain)

technical data checklist

C. ARCHITECTURAL & STRUCTURAL

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
C-1	Vibration-producing equipment requiring isolation	NR			
C-2	Seismic zone and other design load criteria (typhoon, hurricane, earthquake loads, high or low loss potential)	NR			
C-3	Protective shelter evaluation and resistant design criteria (conventional/nuclear blast and radiation, chemical/biological)	NR			
C-4	Unusual foundation requirements (pier, pile, caisson, deep foundations, mat, special treatment, permafrost areas, soil bearing)	NR			
C-5	Designation and strength of units to be accommodated	NR			
C-6	Requirements and data for special design projects	NR			
C-7	Unusual floor and roof loads (safes, equipment)	NR			
C-8	Security features (arms rooms, vaults, interior secure areas)	NR			
	Other: Architectural & Structural (List and number items)	NR			

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D — Designer

E — Other (Check Comments Attached and explain)

technical data checklist

D. MECHANICAL, ELECTRICAL, & UTILITY SYSTEMS

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
D-1	Special mechanical requirements or considerations (elevator, crane, hoist, etc.)	R	C		
D-2	Special peak usage periods and peak leveling techniques	NE			
D-3	Maintenance considerations (accessibility of equipment, compatibility with existing equipment)	NR			
D-4	Plumbing—availability, general system type and characteristics (proposed and/or existing, incl. compressed air and gas)	E	D		
D-5	Heating—availability, general system type and characteristics (proposed and/or existing)	NE			
D-6	Ventilating, air condition/refrigeration—availability, general system type and characteristics (proposed and/or existing)	NR			
D-7	Electrical—availability, general system type and characteristics incl. airfield lighting, communication, etc. (proposed and/or existing)	NR			
D-8	Water supply/waste treatment—availability, general system type and characteristics (proposed and/or existing)	E	D		
D-9	Energy requirements/fuel conversion (sources, availability, loads, types of fuel, etc.)	NE			
D-10	Solar energy evaluation	NE			
	Other Mechanical & Utility Systems (List and number items)	NR			

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently available. Enter code for information source.

COMMENT ATTACHED — Significant information summarized or explained and attached.

DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

***BY WHOM** (Check and insert appropriate letter)

A — DFAE

B — Using Service

C — Construction Service

D — Designer

E — Other (Check Comments Attached and explain)

technical data checklist

F. FIRE PROTECTION

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
F-1	Special fire protection systems or features (detection and suppression equipment, hazards, etc.)	NR			
	Other Fire Protection Considerations (List and number items)	NR			

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently available. Enter code for information source.

COMMENT ATTACHED — Significant information summarized or explained and attached.

DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

***BY WHOM** (Check and insert appropriate letter)

- A — DFAE
- B — Using Service
- C — Construction Service
- D — Designer
- E — Other (Check Comments Attached and explain)

technical data checklist

COST ESTIMATE ANALYSIS										EFFECTIVE PRICING DATE		DATE PREPARED			
For use of this form, see TM 5-800-2; the proponent agency is USACE.										MARCH 1992		MARCH 18, 1992			
PROJECT IRWIN ARMY COMMUNITY HOSPITAL - EEAP				INVOITATION/CONTRACTOR				DRAWING NO.		SHEET OF SHEETS					
LOCATION FORT RILEY, KANSAS				CODE (Check one) <input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C				ESTIMATOR		CHECKED BY R. D. FRYMIRE					
TASK DESCRIPTION		QUANTITY		MH		TOTAL HRS		LABOR		EQUIPMENT		MATERIAL		SHIPPING	
		NO. OF UNITS	UNIT MEAS	UNIT	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	UNIT WT	TOTAL WT			
15 HP VARIABLE FREQUENCY DRIVE		2	EA				315	630		500	10,000		10,630		
CONTRACTOR OH		15%											1595		
" PROFIT		10%											1063		
CONSTRUCTION COST													13,208		
SION		6%											797		
TOTAL THIS SHEET													14085		

COST ESTIMATE ANALYSIS										EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 5-400-2; the proponent agency is USACE.										MARCH 1992		MARCH 18, 1992	
PROJECT IRWIN ARMY COMMUNITY HOSPITAL - EEAP										DRAWING NO.		SHEET OF SHEETS	
LOCATION FORT RILEY, KANSAS										ESTIMATOR WAB		CHECKED BY R. D. FRYMIRE	
TASK DESCRIPTION		QUANTITY		MH		LABOR		EQUIPMENT		MATERIAL		SHIPPING	
NO. OF UNITS	UNIT MEAS	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	TOTAL	UNIT WT	TOTAL WT	
1	EA		3000	3000						13,000			
COMPUTERIZED BOILER MANAGEMENT SYSTEM													
9	EA		500	4500						6,300			
WIRING & PROGRAMMING POINT FUNCTIONS													
SUBTOTAL													
CONTRACTOR OH 15%										2895			
" PROFIT 10%										1930			
CONTINGENCY 5.5%										24,125			
CONSTRUCTION COST										1327			
										25,452			
SI OH 6%										1527			
TOTAL THIS SHEET										26,979			

COST ESTIMATE ANALYSIS										EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 5-800-2; the proponent agency is USACE.										MARCH 1992		MARCH 18, 1992	
PROJECT IRWIN ARMY COMMUNITY HOSPITAL - EEAP										DRAWING NO.		SHEET OF SHEETS	
LOCATION FORT RILEY, KANSAS										ESTIMATOR		CHECKED BY	
										WAB		R. D. FRYMIRE	
TASK DESCRIPTION		QUANTITY		LABOR		EQUIPMENT		MATERIAL		SHIPPING			
		NO. OF UNITS	UNIT MEAS	MH UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT WT	TOTAL WT		
STACK ECONOMIZER	2	EA			5800	11,600			1771	34,542	46142		
RELIEF VALVE	2	EA							555		1110		
PIPING	LS										3000		
SUBTOTAL											50252		
SUBCONTRACTOR	04	15%									7538		
"	PROF	10%									5025		
CONTINGENCY		5.5%									62815		
CONSTRUCTION COST											3455		
SI OH		6%									66270		
											3976		
TOTAL THIS SHEET											76246		

COST ESTIMATE ANALYSIS				INVITATION/CONTRACTOR				EFFECTIVE PRICING DATE				DATE PREPARED	
For use of this form, see TM 8-400-2; the proponent agency is USACE.								January 1992				March 1992	
PROJECT Irwin Army Community Hospital - EEAP				CODE (Check one) <input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C				DRAWING NO. —				SHEET 1 OF 2 SHEETS	
LOCATION Fort Riley, Kansas				<input type="checkbox"/> OTHER				ESTIMATOR WB				CHECKED BY R. D. Frymire	
TASK DESCRIPTION	QUANTITY		MH	LABOR		EQUIPMENT		MATERIAL		TOTAL	SHIPPING		
	NO. OF UNITS	UNIT MEAS		UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST		UNIT WT	TOTAL WT	
SHEET 2 OF 2										30,000			
Sub total										30,000			
Sub CONTRACTOR		15%								4,500			
"		PROFIT 10%								3,000			
Sub total										37,500			
PRIME CONTRACTOR		15%								5,625			
"		PROFIT 10%								3,750			
Sub total										46,875			
CONTINGENCIES		5.5%								2,578			
CONSTRUCTION COST										49,453			
SI OH		6%								2,967			
TOTAL THIS SHEET										52,510			

COST ESTIMATE ANALYSIS				INVITATION/CONTRACTOR				EFFECTIVE PRICING DATE				DATE PREPARED	
PROJECT Irwin Army Community Hospital - EEAP				CODE (Check one) <input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C				January 1992				March 1992	
LOCATION Fort Riley, Kansas				<input type="checkbox"/> OTHER				DRAWING NO. <u> </u>				SHEET <u>2</u> OF <u>2</u> SHEETS	
								ESTIMATOR <u>WB</u>				CHECKED BY R. D. Frymire	
TASK DESCRIPTION	QUANTITY		MH	LABOR		EQUIPMENT		MATERIAL		TOTAL	SHIPPING		
	NO. OF UNITS	UNIT MEAS		UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST		UNIT WT	TOTAL WT	
FURNISH & INSTALL													
O2 Trim													
Combustion													
System	2	LS								30,000			
TOTAL THIS SHEET										30,000			

4. BOILER BURNERS/MODULAR BOILER

1. COMPONENT ARMY		FY 19 <u>95</u> MILITARY CONSTRUCTION PROJECT DATA			2. DATE 19 APR 1992 14 APR 1992	
3. INSTALLATION AND LOCATION Fort Riley Kansas			4. PROJECT TITLE ECIP Boiler Burners/Modular Boiler			
5. PROGRAM ELEMENT		6. CATEGORY CODE 510 10	7. PROJECT NUMBER 40477		8. PROJECT COST (\$000) 580	
9. COST ESTIMATES						
ITEM			U/M	QUANTITY	UNIT COST	COST (\$000)
PRIMARY FACILITY						468
Bldg 610 ECIP Mod			BD	1	75,606	(76)
Bldg 620 Mod			BD	1	59,236	(59)
Bldg 621 Mod			BD	1	46,584	(47)
Trench & Backfill			LF	1,200	3.48	(4)
Regulating Stations			EA	2	2,080	(4)
Test & Balance			EA	17	210.00	(4)
High Turndown Boilers			EA	1	274,272	(278)
SUPPORTING FACILITIES						29
Design Cost			LS	---	---	(29)
ESTIMATED CONTRACT COST						497
CONTINGENCY PERCENT (10.0%)						50
SUBTOTAL						547
SUPERVISION, INSPECTION & OVERHEAD (6.00%)						33
CATEGORY E EQUIPMENT						(0)
TOTAL REQUEST						580
TOTAL REQUEST (ROUNDED)						580
INSTALLED EQUIPMENT-OTHER APPROPRIATIONS						(0)
10. DESCRIPTION OF PROPOSED CONSTRUCTION						
<p>The project will include installing modular high-efficiency, gas-fired boilers for building heating and heating of domestic hot water in Buildings 610, 620 and 621 and high-efficiency, gas-fired burners in the energy center boilers with high-turndown ratio for capacity modulation. The project will include all required flues, piping, water heaters with circ. pumps, expansion tanks, electrical connections and demolition at each building.</p>						
11. REQUIREMENT:						
PROJECT:						
<p>Install high-efficiency, gas-fired boilers and associated equipment in Buildings 610, 620, and 621, and high-efficiency, gas-fired burners in the boilers in the Irwin Army Community Hospital energy center at Fort Riley, Kansas.</p>						

1. COMPONENT ARMY	FY 19 <u>95</u> MILITARY CONSTRUCTION PROJECT DATA		2. DATE 19 APR 1992 14 APR 1992												
3. INSTALLATION AND LOCATION Fort Riley Kansas															
4. PROJECT TITLE ECIP Boiler Burners/Modular Boiler		5. PROJECT NUMBER 40477													
<p>REQUIREMENT:</p> <p>This project is required to reduce the gas consumption caused by low boiler efficiencies and piping and heat exchanger losses.</p> <p>CURRENT SITUATION:</p> <p>Presently Buildings 610, 620, and 621 are served with high pressure steam generated at the hospital boiler plant and piped to each building underground thru manholes and expansion loops. Steam pressure at each building is reduced and is utilized thru separate heat exchangers to heat building domestic hot water and building water for heating. The present hospital complex heating requirements are served by the two large boilers in the energy center and operate well below their rated capacity during this time.</p> <p>IMPACT IF NOT PROVIDED:</p> <p>Failure to approve this project will result in a continued greater consumption of gas needed to generate the steam required to heat the domestic hot water and building water for heating at each building and to handle the hospital complex heating requirements.</p> <p>ADDITIONAL:</p> <p>This project complies with the scope and design criteria of CEHSC-FU-M, Energy Conservation Investment Program (ECIP) Guidance, that were in effect June 1991. The project has a Discounted Savings Ratio (SIR) of 2.40 and a SPB of 5.0 years. The implementation of this project will provide an annual energy savings of 28,950 MBTU and an annual dollar savings of \$107,960.</p> <p>Project validation will be through the use of metering gas flow at the Energy Plant boilers and Buildings 610, 620, and 621. Comparison of total annual gas consumption along with engineering calculations for electric consumption will be utilized.</p> <table border="0"> <tr> <td>ESTIMATED CONSTRUCTION START:</td> <td>APR 1995</td> <td>INDEX:</td> <td>1992</td> </tr> <tr> <td>ESTIMATED MIDPOINT OF CONSTRUCTION:</td> <td>OCT 1995</td> <td>INDEX:</td> <td>2029</td> </tr> <tr> <td>ESTIMATED CONSTRUCTION COMPLETION:</td> <td>APR 1996</td> <td>INDEX:</td> <td>2055</td> </tr> </table>				ESTIMATED CONSTRUCTION START:	APR 1995	INDEX:	1992	ESTIMATED MIDPOINT OF CONSTRUCTION:	OCT 1995	INDEX:	2029	ESTIMATED CONSTRUCTION COMPLETION:	APR 1996	INDEX:	2055
ESTIMATED CONSTRUCTION START:	APR 1995	INDEX:	1992												
ESTIMATED MIDPOINT OF CONSTRUCTION:	OCT 1995	INDEX:	2029												
ESTIMATED CONSTRUCTION COMPLETION:	APR 1996	INDEX:	2055												

1. COMPONENT ARMY	FY 19_95 MILITARY CONSTRUCTION PROJECT DATA		2. DATE Rev. 4/92 3 Sept. 1991
3. INSTALLATION AND LOCATION Irwin Army Community Hospital Fort Riley, Kansas			
4. PROJECT TITLE Boiler Burners/Modular Boiler (ECIP)		5. PROJECT NUMBER	

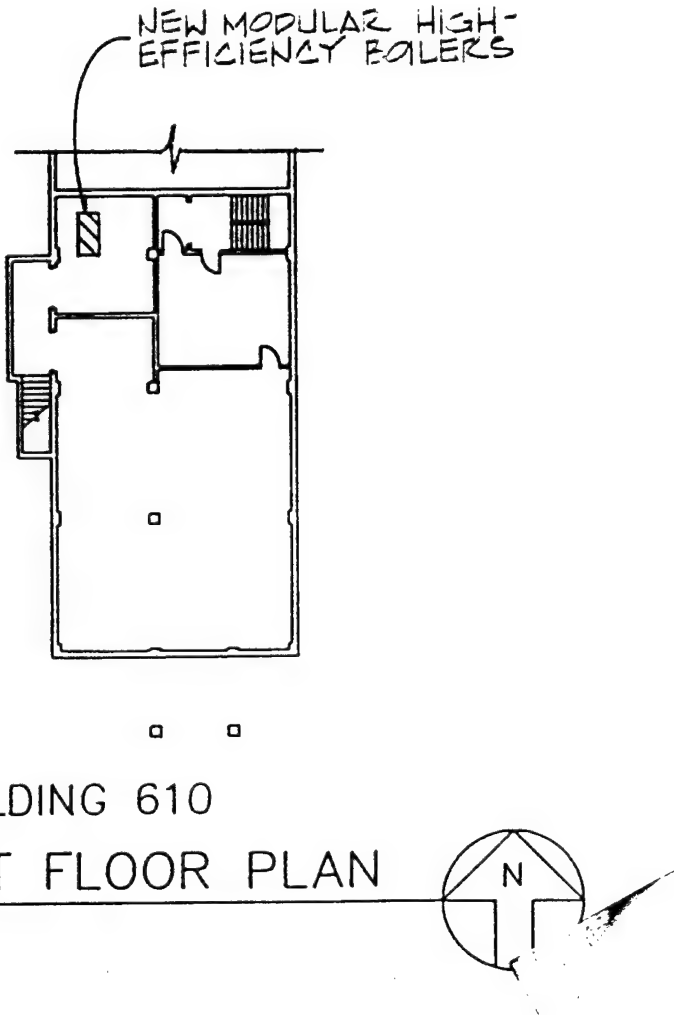
The diagram is a site plan of the Irwin Army Community Hospital. It shows several buildings: BLDG. 610 (top left), BLDG. 615 (middle left), BLDG. 600 (large central building), and a group of buildings at the bottom labeled BLDG. 025, BLDG. 026, BLDG. 027, and BLDG. 028. A large hatched area is located between BLDG. 615 and BLDG. 600. An 'ENERGY PLANT' is indicated near BLDG. 615. A 'UTILITY TUNNEL' runs vertically through the center. 'EXISTING UNDERGROUND DISTRICT STEAM SYSTEM' is labeled on the left. Streets shown include '3RD STREET' (top left), 'C STREET' (bottom right), and 'CAISSON HILL ROAD' (bottom right). Various utility lines and connections are depicted throughout the site.

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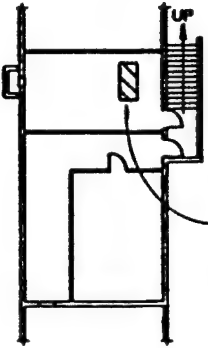
PREVIOUS EDITIONS MAY BE USED INTERNALLY
UNTIL EXHAUSTED

PAGE NO.

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(WHEN DATA IS ENTERED)

1. COMPONENT ARMY	FY 19 <u>95</u> MILITARY CONSTRUCTION PROJECT DATA	2. DATE Rev. 4/92 3 Sept. 1991
3. INSTALLATION AND LOCATION Irwin Army Community Hospital Fort Riley, Kansas		
4. PROJECT TITLE Boiler Burners/Modular Boiler (ECIP)		5. PROJECT NUMBER
<div style="text-align: center;">  <p>NEW MODULAR HIGH-EFFICIENCY BOILERS</p> <p>□ □</p> <p>BUILDING 610</p> <p><u>BASEMENT FLOOR PLAN</u></p> </div>		


1. COMPONENT ARMY	FY 19⁹⁵ MILITARY CONSTRUCTION PROJECT DATA	2. DATE Rev. 4/92 3 Sept. 1991
3. INSTALLATION AND LOCATION Irwin Army Community Hospital Fort Riley, Kansas		
4. PROJECT TITLE Boiler Burners/Modular Boiler (ECIP)		5. PROJECT NUMBER

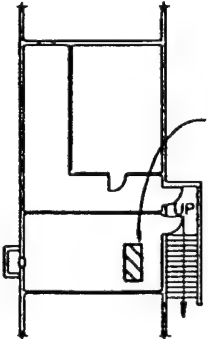


NEW MODULAR HIGH-EFFICIENCY BOILERS

BUILDING 620

BASEMENT FLOOR PLAN






NEW MODULAR HIGH-EFFICIENCY BOILERS

BUILDING 621

BASEMENT FLOOR PLAN



1. COMPONENT ARMY	FY 19 <u>95</u> MILITARY CONSTRUCTION PROJECT DATA	2. DATE Rev. 4/92 3 Sept. 1991
3. INSTALLATION AND LOCATION Irwin Army Community Hospital Fort Riley, Kansas		
4. PROJECT TITLE Boiler Burners/Modular Boiler (ECIP)		5. PROJECT NUMBER
<div data-bbox="297 449 1273 1411"> <p>EXISTING BOILERS W/ NEW BURNERS</p> </div> <div data-bbox="251 1537 1024 1596"> <p>ENERGY PLANT FLOOR PLAN</p> </div> <div data-bbox="1075 1524 1219 1667"> </div>		

INTRODUCTION

The existing boiler plant consists of two Babcock Wilcox Boilers built in 1955. Each boiler is rated at 34,000 lbs/hr generating 125 psig steam. The boiler operation is alternated with one as primary and the second unit as standby. Based on boiler log information available for fiscal year 1990 the maximum demand for anyone boiler was in the range of 22,000 lbs/hr. Currently these boilers are providing district steam to Buildings 610, 620 and 621 for building domestic hot water and building heating. With the proposal to eliminate district steam to Buildings 610, 620 and 621, replace steam driven chillers and recover waste heat for preheating boiler feedwater and building reheat it is anticipated the maximum demand will decrease and the off-peak demand will decrease to a baseload. The baseload, consisting of domestic hot water for Building 600, sterilizers and kitchen equipment is estimated at 7445 lbs/hr. At this rate the existing boilers will operate less than five percent capacity for most of the year.

The TRACE 600 computer program was used to model the existing boilers with high-efficiency, high-turndown ratio burners derated to a maximum of 22,000 lbs/hr. Since the boiler efficiency is less at part load than at full load energy is saved by more closely matching the equipment size to the load. Electrical energy is saved due to the reduction of consumption by boiler auxiliaries.

The existing oversized boilers operating at part load conditions (new baseload approximately 7500 lbs/hr) were modeled in computer run T0115080 Alt. 1. The new 22,000 lbs/hr high-efficiency burners were modeled in computer run T0115080 Alt. 3.

The TRACE 600 program was used to model Building 610, 620 and 621 as they now operate in T0095080 existing buildings combined Alt. 1. The existing steam consumption is calculated based on steam supplied by the 34,000 lbs/hr central plant boilers with maximum boiler efficiency at full load of 78 percent. The individual building operation with new 90 percent efficient modular gas fired boilers is modeled in run T0095080 Alt. 2. The modular gas fired boilers in the individual buildings reduces gas consumption due to higher boiler efficiencies and elimination of piping and heat exchanger losses. Electrical energy is saved thru elimination of individual building condensate pump and reduced central plant boiler auxiliary. Manual calculations attached herein were performed to determine savings due to domestic hot water heater replacement.

ASSUMMED CONDITIONS

Heat exchanger efficiency = 80 percent.

District piping losses = 10 percent.

Existing boiler efficiency at full load = 78 percent.

Off-peak boiler efficiency at full load - 85 percent.

Gas cost = \$3.7/mcf

Electrical cost = \$0.038/kwh

Annual repair cost for existing 36 year old boilers will be reduced slightly due to new high-efficiency burners. Due to undefinable conditions this savings will not be included in LCC.

LIFE CYCLE COST ANALYSIS SUMMARY

ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: Fort Riley, Ks. REGION NO.: 7 PROJECT NO.: 40477
 PROJECT TITLE: Boiler Burners/Modular Boiler FISCAL YR.: 1995
 DISCRETE PORTION NAME: Burners/Modular Boilers
 ANALYSIS DATE: 4-15-92 ECONOMIC LIFE 15 YEARS PREPARED BY: RDF

1. INVESTMENT

A. CONSTRUCTION COST \$ 484573
 B. SIOH \$ 29075
 C. DESIGN COST \$ 29075
 D. SALVAGE VALUE - \$ 0
 E. TOTAL INVESTMENT (1A + 1B + 1C - 1D) \$ 542723

2. ENERGY SAVINGS (+) / COST (-)

ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	COST \$/MBTU/YR(1)	SAVINGS MBTU/YR(2)	ANNUAL \$ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	\$ <u>11.13</u>	<u>223</u>	\$ <u>2484</u>	<u>10.77</u>	\$ <u>26756</u>
B. DIST	\$ <u> </u>	<u> </u>	\$ <u> </u>	<u> </u>	\$ <u> </u>
C. RESID	\$ <u> </u>	<u> </u>	\$ <u> </u>	<u> </u>	\$ <u> </u>
D. NG	\$ <u>3.59</u>	<u>28727</u>	\$ <u>103129</u>	<u>12.02</u>	\$ <u>1239609</u>
E. COAL	\$ <u> </u>	<u> </u>	\$ <u> </u>	<u> </u>	\$ <u> </u>
F. TOTAL			\$ <u> </u>		\$ <u>1266365</u>

3. NONENERGY SAVINGS(+) / COST (-)

A. ANNUAL RECURRING (+/-)
 (1) DISCOUNT FACTOR (TABLE A) 10.67
 (2) DISCOUNTED SAVING/COST (3A X 3A1) \$ -1786
 \$ -19057

B. NONRECURRING SAVINGS (+) / COST (-)

ITEM	SAVINGS(+) Replace-COST(-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR(3)	DISCOUNTED SAVINGS (+) COST (-) (4)
(1) ment	\$ <u>20665</u>	<u>1</u>	<u>.96</u>	\$ <u>19838</u>
(2) "	\$ <u>20665</u>	<u>2</u>	<u>.91</u>	\$ <u>18805</u>
(3) "	\$ <u>20665</u>	<u>3</u>	<u>.87</u>	\$ <u>17979</u>
(4) TOTAL	\$ <u>61995</u>			\$ <u>56622</u>

C. TOTAL NONENERGY DISCOUNTED SAVINGS (+) / COST (-) (3A2 + 3BD4) \$ 37565

D. PROJECT NONENERGY QUALIFICATION TEST

(1) 25% MAX NONENERGY CALC (2F5 X .33) \$ 417901
 a. IF 3D1 IS = OR > 3C GO TO ITEM 4
 b. IF 3D1 IS < 3C CALC S1R = (2F5 + 3D1) / 1E =
 c. IF 3D1b IS = > 1 GO TO ITEM 4
 d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3 + 3A + (3B1d / YEARS ECONOMIC LIFE) \$ 107960

5. TOTAL NET DISCOUNTED SAVINGS (2F5 + 3C) \$ 1303931

6. DISCOUNTED SAVINGS RATIO (IF < 1 PROJECT DOES NOT QUALIFY) (SIR) = (5 / 1E) = 2.40

7. SIMPLE PAYBACK PERIOD (ESTIMATED YEARS) SPB = 1E/4 5.03

STORAGE WATER HEATER - BLDG. 610

TM 5-810-5 RECOMMENDS THE PER CAPITA METHOD WHEN THE NUMBER OF PEOPLE IS KNOWN AND IS MORE THAN 50 (TM 5-810-5 TABLE 4-4)

N = NUMBER OF PEOPLE = 151
G = GALLONS PER DAY = 30
B = DURATION OF AVERAGE HEATING TIME = 14
D = DURATION OF PEAK LOAD = 6
A = AVERAGE HOURLY CAPACITY
P = PEAK HOURLY REQUIREMENTS, GALLONS

$$A = \frac{GN}{B} \quad A = \frac{30(151)}{14} \quad A = 336$$

$$P = \frac{GN}{D} \quad P = \frac{30(151)}{6} \quad P = 785$$

$$\frac{P-A}{.75} = \text{STORAGE REQUIRED} \quad \frac{785-336}{.75} = 599$$

599 GALLONS STORAGE

785 GPH RECOVERY @ 85° Δt (40°F - 125°F)

$$\frac{785}{60} \times 85^\circ \Delta t \times 500 = 556042 \text{ BTU/HR}$$

$$556042 \times 6 \text{ HRS/DAY} \times 365 \text{ DAYS/YR} = 1,217,731,980 \text{ BTUH/YR.}$$

$$\frac{\left(\frac{1,217,731,980}{.9 \text{ EFF.}} \right)}{1031,000} = 1312 \text{ MCF/YR}$$

EXISTING WATER HEATER BLDG. 610

782 GALLON STORAGE
579 GPH RECOVERY
PEAK USAGE - 6 HRS/DAY

$$\frac{579}{60} \times 100^\circ \Delta t \times 500 = 482,500 \text{ BTU/HR}$$

$$482,500 \times 6 \text{ HRS/DAY} \times 365 \text{ DAYS/YR} = 1,056,675,000 \text{ BTU/YR}$$

$$\text{BOILER EFF} = .78$$

$$\text{PIPING EFF} = .90 \quad .78(.9 \times .8) = 0.56 \text{ (EXISTING SYSTEM)}$$

$$\text{HEATER EFF} = .80$$

$$\frac{\left(\frac{1,056,675,000}{.56 \text{ EFF}} \right)}{1,031,000} = 1830 \text{ MCF/YR}$$

DIFFERENCE IN ENERGY REQUIRED - BLDG. 610

EXISTING HEATER
NEW HEATER

$$\begin{array}{r} 1,830 \text{ MCF/YR} \\ 1,312 \text{ MCF/YR} \\ \hline 518 \text{ MCF/YR} \end{array}$$

STORAGE WATER HEATER - BLDG. 620

TM 5-810-5 RECOMMENDS THE PER FIXTURE METHOD WHEN THE NUMBER OF PEOPLE IS KNOWN AND IS LESS THAN 50.
(TM 5-810-5 TABLE 4-3)

<u>FIXTURE</u>	<u>NO. GPH</u>
SHOWER	$16 \times 150 = 2400$
LAVATORY	$16 \times 3 = 48$
KITCHEN SINK	$16 \times 20 = 320$
LAUNDRY MACHINE	$2 \times 35 = 70$
	<u>2158</u> TOTAL GPH

PEAK USAGE - 4 HRS/DAY

STORAGE CONVERSION FACTOR - 0.185

RECOVERY CONVERSION FACTOR - 0.25

$$\frac{2158(0.185)}{0.75(\text{USABLE})} = \underline{680} \text{ STORAGE}$$

$$2158(0.25) = \underline{690} \text{ RECOVERY}$$

EXISTING WATER HEATER - BLDG 620

365 GALLON STORAGE

300 GPH RECOVERY

PEAK USAGE - 4 HRS/DAY

* THE TM 5-810-5 CRITERIA RESULTS IN A LARGER CAPACITY HEATER THAN IS CURRENTLY USED IN THIS BUILDING. THE EXISTING HEATER SATISFIES THE BUILDING LOAD. IT IS RECOMMENDED THE EXISTING HEATER BE REPLACED BY ONE OF EQUAL CAPACITY.

EXISTING ENERGY USAGE:

$$\frac{300}{60} \times 100^{\circ}\Delta t \times 500 = 250,000 \text{ BTU/HR}$$

$$250,000 \times 4 \text{ HRS/DAY} \times 365 \text{ DAYS/YR} = 365,000,000 \text{ BTU/YR}$$

$$\text{BOILER EFF.} = .78$$

$$\text{PIPING EFF.} = .90 \quad .78(.9 \times .8) = 0.56$$

$$\text{HEATER EFF.} = .80$$

$$\frac{\left(\frac{365,000,000}{.56 \text{ EFF}} \right)}{1,031,000} = 632 \text{ MCF/YR}$$

NEW ENERGY USAGE:

$$\frac{300}{60} \times 85^{\circ}\Delta t \times 500 = 212,500 \text{ BTU/HR}$$

$$212,500 \times 4 \text{ HRS/DAY} \times 365 \text{ DAYS/YR} = 310,250,000 \text{ BTU/YR}$$

$$\frac{\left(\frac{310,250,000}{.9 \text{ EFF}} \right)}{1,031,000} = 334 \text{ MCF/YR}$$

DIFFERENCE IN ENERGY REQUIRED - BLDG. 620

EXISTING	632 MCF/YR
NEW	334 MCF/YR
	<u>298 MCF/YR</u>

STORAGE WATER HEATER - BLDG. G21

TM 5-810-5 RECOMENDS THE PER FIXTURE METHOD WHEN THE NUMBER OF PEOPLE IS KNOWN AND IS LESS THAN 50. (TM 5-810-5 TABLE 4-3)

<u>FIXTURE</u>	<u>NO. GPH</u>
SHOWER	$12 \times 150 = 1800$
LAVATORY	$12 \times 3 = 36$
KITCHEN SINK	$12 \times 20 = 240$
LAUNDRY MACHINE	$2 \times 35 = 70$
	2,146 TOTAL GPH

PEAK USAGE - 4 HRS/DAY

STORAGE CONVERSION FACTOR - 0.185

RECOVERY CONVERSION FACTOR - 0.250

$$\frac{2,146(0.185)}{0.75 \text{ USABLE}} = \underline{529} \text{ STORAGE}$$

$$2,146(0.25) = \underline{537} \text{ RECOVERY}$$

EXISTING WATER HEATER - BLDG. G21

310 GALLON STORAGE

240 GPH RECOVERY

PEAK USAGE - 4 HRS/DAY

* THE TM 5-810-5 CRITERIA RESULTS IN A LARGER CAPACITY HEATER THAN IS CURRENTLY USED IN THIS BUILDING. THE EXISTING HEATER SATISFIES THE BUILDING LOAD. IT IS RECOMENDED THE EXISTING HEATER BE REPLACED BY ONE OF EQUAL CAPACITY.

EXISTING ENERGY USAGE:

$$\frac{240}{60} \times 100^\circ \Delta t \times 500 = 200,000 \text{ BTU/HR}$$

$$200,000 \times 4 \text{ HRS/DAY} \times 365 \text{ DAYS/YR} = 292,000,000 \text{ BTU/YR}$$

$$\text{BOILER EFF.} = .78$$

$$\text{PIPING EFF.} = .90 \quad .78(.9 \times .8) = 0.56$$

$$\text{HEATER EFF.} = .80$$

$$\frac{\left(\frac{292,000,000}{0.56} \right)}{1,031,000} = 506 \text{ MCF/YR}$$

NEW ENERGY USAGE:

$$\frac{240}{60} \times 85^\circ \Delta t \times 500 = 170,000 \text{ BTU/HR}$$

$$170,000 \times 4 \text{ HRS/DAY} \times 365 \text{ DAYS/YR} = 248,200,000 \text{ BTU/YR}$$

$$\frac{\left(\frac{248,200,000}{.9 \text{ EFF.}} \right)}{1,031,000} = 267 \text{ MCF/YR}$$

DIFFERENCE IN ENERGY REQUIRED - BLDG-621

EXISTING	506 MCF/YR
NEW	267 MCF/YR
	<u>239 MCF/YR</u>

SUMMARY OF ENERGY SAVINGS: (WATER HEATERS)

BLDG. 610	518 MCF/YR
BLDG. 620	298 MCF/YR
BLDG. 621	<u>239 MCF/YR</u>
	1,055 MCF/YR

DIFFERENCE IN ENERGY REQUIRED FOR BLDG'S 610, 620 & 621

BASE RUN ANNUAL KWH	9,339,166
TØØ95080 ALT 2 KWH	<u>9,334,257</u>
	4,909 KWH

BASE RUN ANNUAL MCF:	541,037 THERM	$\times \frac{0.1 \times 10^6}{1.031 \times 10^6}$	= 52,477
TØØ95080 ALT 2 MCF:	515,220 THERM	$\times \frac{0.1 \times 10^6}{1.031 \times 10^6}$	= <u>49,973</u>
			2504

DUE TO PIPING LOSSES & HEAT EXCHANGER EFF.
 ANNUAL MCF = $2504 \div 0.8 \times 1.1$
 = 3443 MCF

ANNUAL ENERGY SAVINGS

4909 KWH	$\times 3413 \text{ BTU/KWH}$	= 16.754×10^6
3443 MCF	$\times 1.031 \times 10^6 \text{ BTU/MCF}$	= 3549.73×10^6
1055 MCF	$\times 1.031 \times 10^6 \text{ BTU/MCF}$	= <u>1087.71×10^6</u>
		4654.19×10^6

DIFFERENCE IN ENERGY REQUIRED FOR BOILER BURNERS

TØØ15080 ALT. 1 KWH	8,509,402
TØØ15080 ALT. 3 KWH	<u>8,448,912</u>
	60,490 KWH

$$\begin{array}{r}
 T\emptyset 115080 \text{ ALT. 1 THERMS} \quad 432,554 \\
 T\emptyset 115080 \text{ ALT. 3 THERMS} \quad 191,656 \\
 \hline
 240,898 \text{ THERMS}
 \end{array}$$

$$\text{MCF} = 240,898 \text{ THERMS} \times \frac{0.1 \times 10^6 \text{ BTU/THERM}}{1.031 \times 10^6 \text{ BTU/MCF}}$$

$$= 23,365$$

ANNUAL ENERGY SAVINGS

$$60,490 \text{ KWH} \times 3413 \text{ BTU/KWH} = 206.45 \times 10^6 \text{ BTU}$$

$$23,365 \text{ MCF} \times 1.031 \times 10^6 \text{ BTU/MCF} = 24,089.3 \times 10^6 \text{ BTU}$$

$$24,295.8 \times 10^6 \text{ BTU/YR}$$

ANNUAL TOTAL ELECTRIC ENERGY SAVINGS

$$4909 \text{ KWH} \times 3413 \text{ BTU/KWH} = 16.754 \times 10^6$$

$$60,490 \text{ KWH} \times 3413 \text{ BTU/KWH} = 206.45 \times 10^6$$

$$223.21 \times 10^6$$

DOLLAR SAVINGS

$$4909 \text{ KWH} \times \$0.038/\text{KWH} = \$186.54$$

$$60,490 \text{ KWH} \times \$0.038/\text{KWH} = \$2298.62$$

$$\$2485.16$$

ANNUAL TOTAL NATURAL GAS ENERGY SAVINGS

$$3443 \text{ MCF} \times 1.031 \times 10^6 \text{ BTU/MCF} = 3549.73 \times 10^6$$

$$1055 \text{ MCF} \times 1.031 \times 10^6 \text{ BTU/MCF} = 1087.71 \times 10^6$$

$$23,365 \text{ MCF} \times 1.031 \times 10^6 \text{ BTU/MCF} = 24,089.3 \times 10^6$$

$$28,726.7 \times 10^6$$

DOLLAR SAVINGS

3443 MCF X	\$ 3.7 / MCF	= \$ 12,739.10
1055 MCF X	\$ 3.7 / MCF	= \$ 3,903.50
23,365 MCF X	\$ 3.7 / MCF	= \$ 86,450.50
		<u>\$ 103,093.10</u>

ANNUAL RECURRING COSTS FOR MAINTENANCE ARE BASED ON MAINTENANCE FREQUENCY DERIVED FROM MEANS FACILITIES MAINTENANCE STANDARDS.

EXISTING SYSTEM FOR BUILDINGS 610, 620 & 621.

LUBRICATE COND. PUMPS - 6 @ 1.0 HR X	\$ 38.00 / HR =	228
" CIRC. PUMPS - 3 @ 1.0 HR X	\$ 38.00 / HR =	114
HEAT EXCHGR & AUX. - 3 @ 1.0 HR X	\$ 38.00 / HR =	114
HOT HTR GENERATOR - 3 @ 1.0 HR X	\$ 38.00 / HR =	114

EXISTING SYSTEM MAINTENANCE COST = \$ 570.00 / YE

NEW SYSTEM:

LUBRICATE CIRC PUMPS - 3 @ 1.0 HR X	\$ 38.00 / HR =	114
MAINTAIN BOILERS - 14 @ 4 HR X	\$ 38.00 / HR =	2128
HOT HTR GENERATOR - 3 @ 1.0 HR X	\$ 38.00 / HR =	114
		<u>\$ 2356 / YE</u>

ANNUAL RECURRING MAINTENANCE COST DIFFERENCE
 = \$ 570.00 - \$ 2356.00
 = \$ - 1786.00

EQUIPMENT SERVICE LIFE: (ASHRAE HANDBOOK 1987)

HOT WATER BOILERS = 25 YRS

HEAT EXCHANGERS = 24 YRS

BASE MTD PUMP = 20 YRS

PIPE MTD PUMP = 10 YRS

CONDENSATE PUMP = 15 YRS

MOTORS = 18 YRS

NONRECURRING EXPENSES FOR THE EXISTING SYSTEM WILL OCCUR THRU-OUT THE STUDY LIFE DUE TO THE EQUIPMENT AGE (32 YEARS) GREATER THEN EXPECTED SERVICE LIFE. FOR THIS PROJECT THE EXISTING SYSTEM REPLACEMENT COST EST. AT \$ 61,995 WILL BE DIVIDED EQUALLY OVER THE FIRST THREE YEARS OF THE STUDY LIFE.

$$\therefore \text{YEAR 1} = \$61,995 / 3 = \$20,665$$

$$\text{YEAR 2} = \$20,665$$

$$\text{YEAR 3} = \$20,665$$

TOTAL ANNUAL RECURRING MAINTENANCE COST =
- \$1786

TOTAL NONRECURRING SAVINGS WILL OCCUR IN THE FIRST THREE YEARS OF THE STUDY AS

FOLLOWS: YEAR 1 = \$20,665

YEAR 2 = \$20,665

YEAR 3 = \$20,665

COST ESTIMATE ANALYSIS										INVOITATION/CONTRACTOR		EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 5-800-2; the proponent agency is USACE.										CODE (Check one) <input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C		January 1992		April 1992	
PROJECT Irwin Army Community Hospital - EEAP										DRAWING NO. OFF PEAK/MDD. BOILER		SHEET 1 OF 6 SHEETS			
LOCATION Fort Riley, Kansas										ESTIMATOR KLAB		CHECKED BY R. D. Frymire			
TASK DESCRIPTION	QUANTITY		MH	LABOR		EQUIPMENT		MATERIAL		TOTAL	SHIPPING				
	NO. OF UNITS	UNIT MEAS		UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST		UNIT WT	TOTAL WT			
SHEET 2 OF 6										171,400					
SHEET 3 OF 6										41,969					
SHEET 4 OF 6										27,115					
SHEET 5 OF 6										37,114					
SHEET 6 OF 6										15,761					
SUBTOTAL										293,959					
SUBCONTRACTOR OH @ 15%										44,094					
SUBCONTRACTOR PROFIT @ 10%										29,396					
SUBTOTAL										367,449					
GEN. CONTRACTOR OH @ 15%										55,117					
GEN. CONTRACTOR PROFIT @ 10%										36,747					
SUBTOTAL										459,311					
CONTINGENCIES @ 5.5%										25,262					
CONSTRUCTION COST BASED ON 1992 MEANS COSTS										484,572					
SIOH @ 6%										29,074					
TOTAL THIS SHEET										613,927					

COST ESTIMATE ANALYSIS										INVOITATION/CONTRACTOR		EFFECTIVE PRICING DATE		DATE PREPARED	
PROJECT Irwin Army Community Hospital - EEAP LOCATION Fort Riley, Kansas										CODE (Check one) <input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> OTHER		January 1992 DRAWING NO. OFF PEAK/MOD. BOILER ESTIMATOR WAB		April 1992 SHEET 2 OF 6 CHECKED BY R. D. Frymire	
TASK DESCRIPTION	QUANTITY		MH	LABOR		EQUIPMENT		MATERIAL		SHIPPING					
	NO. OF UNITS	UNIT MEAS		TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	UNIT WT	TOTAL WT			
ENERGY PLANT															
GENERAL DEMOLITION	1	LS													
PACKAGE 22,000 MBH															
BURNERS	2	EA		13,000	26,000	1000	2000	5745	114,900						
GAS TRAIN INSTALLATION	1	LS													
BOILER MODIFICATIONS	1	LS													
START-UP/CHECK-OUT	1	LS													
TOTAL THIS SHEET															

COST ESTIMATE ANALYSIS										INVIATION/CONTRACTOR		EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 5-800-2; the proponent agency is USACE.										January 1992		April 1992			
PROJECT		Irwin Army Community Hospital - EEAP		CODE (Check one)		<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C		DRAWING NO.		OFF PEAK / MOD. BOILER		SHEET 3 OF 6 SHEETS			
LOCATION		Fort Riley, Kansas		<input type="checkbox"/> OTHER		ESTIMATOR		BKC		CHECKED BY		R. D. Frymire			
TASK DESCRIPTION	QUANTITY		MH	LABOR		EQUIPMENT		MATERIAL		TOTAL	SHIPPING		TOTAL WT		
	NO. OF UNITS	UNIT MEAS		TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE		COST	UNIT WT			
GAS FIRED EXHAUSTERS															
BUDG. 610															
HEAT	4	EA		1050	4200				2005	11220	15420				
DOM. HW	2	EA		805	1730				2245	4490	6220				
BUDG 620															
HEAT	3	EA		780	2340				1730	5190	7530				
DOM. HW	1	EA		820	820				1949	1949	2769				
BUDG. 621															
HEAT	3	EA		780	2340				1730	5190	7530				
DOM. HW	1	EA		780	780				1720	1720	2500				
TOTAL THIS SHEET											41969				

COST ESTIMATE ANALYSIS										INVOITATION/CONTRACTOR		EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 5-800-2; the proponent agency is USACE.												January 1992		April 1992	
PROJECT Irwin Army Community Hospital - EEAP										CODE (Check one) <input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C		DRAWING NO. OFF PEAK/MDD BOILER		SHEET 4 OF 6 SHEETS	
LOCATION Fort Riley, Kansas										<input type="checkbox"/> OTHER		ESTIMATOR BKC		CHECKED BY R. D. Frymire	
TASK DESCRIPTION	QUANTITY		MH	LABOR		EQUIPMENT		MATERIAL		TOTAL	SHIPPING				
	NO. OF UNITS	UNIT MEAS		TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE		COST	UNIT WT	TOTAL WT		
BLR HUE & FITTINGS															
BLDG. 610 (4")	150	LF	—	9.50	1425	—	—	13.50	2025	3450					
BLDG. 600 (4")	100	LF	—	9.50	950	—	—	13.50	1350	2300					
BLDG. 601 (4")	100	LF	—	9.50	950	—	—	13.50	1350	2300					
MIS. PIPING W/INSUL.															
BLDG 610	1	LS	—	—	1710	—	—	—	640	2350					
BLDG 600	1	LS	—	—	1140	—	—	—	430	1570					
BLDG 601	1	LS	—	—	1140	—	—	—	430	1570					
MDD. BOILER CONTROLS	3	EA	—	—	—	—	—	4525	13575	13575					
TOTAL THIS SHEET										27115					

COST ESTIMATE ANALYSIS										INVOITATION/CONTRACTOR		EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 5-900-2; the proponent agency is USACE.										January 1992		April 1992			
PROJECT Irwin Army Community Hospital - EEAP										DRAWING NO. OFF PEAK / MDP. BOILER		SHEET 5 OF 6 SHEETS			
LOCATION Fort Riley, Kansas										ESTIMATOR BKC		CHECKED BY R. D. Frymire			
TASK DESCRIPTION	QUANTITY		MH	LABOR		EQUIPMENT		MATERIAL		TOTAL	SHIPPING				
	NO. OF UNITS	UNIT MEAS		UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST		UNIT WT	TOTAL WT			
WATER HTR W/ PUMP															
BLDG GLO (780 GAL)	1	EA	—	213	213	—	—	9476	9476	9689					
BLDG GLO (300 GAL)	1	EA	—	138	138	—	—	6180	6180	7118					
BLDG GLO (300 GAL)	1	EA	—	105	105	—	—	5002	5002	5107					
GAS PIPING & FITTINGS															
BLDG GLO (1") 400	400	LF	—	3.25	1300	—	—	3.7	1480	2780					
BLDG GLO (2") 1000	1000	LF	—	3.5	3500	—	—	4.21	4210	7710					
BLDG GLO (1") 300	300	LF	—	3.25	975	—	—	3.7	1110	2085					
EXPANSION TANKS	3	EA	—	35	105	—	—	1040	3120	3225					
TOTAL THIS SHEET										37714					

COST ESTIMATE ANALYSIS										INVOITATION/CONTRACTOR		EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 5-800-2; the proponent agency is USACE.												January 1992		April 1992	
PROJECT Irwin Army Community Hospital - EEAP										CODE (Check one) <input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C		DRAWING NO. OFF PEAK / MOD. BOILER		SHEET 6 OF 6 SHEETS	
LOCATION Fort Riley, Kansas										<input type="checkbox"/> OTHER		ESTIMATOR BKC		CHECKED BY R. D. Frymire	
TASK DESCRIPTION	QUANTITY		MH	LABOR		EQUIPMENT		MATERIAL		TOTAL	SHIPPING				
	NO. OF UNITS	UNIT MEAS		TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE		COST	UNIT WT	TOTAL WT		
BUDG 610, 620 & 621	3	EA	—	—	1000	3000	—	—	—	—	3000				
DEMO. OF EQUIP. RM.															
MIS. ELECT.	3	EA	—	—	350	1050	—	—	150	450	1500				
CIRC. PUMPS															
#610	1	EA	—	—	92	92	—	—	1070	1070	1162				
#620	1	EA	—	—	92	92	—	—	860	860	952				
#621	1	EA	—	—	92	92	—	—	860	860	952				
NEW GASLINE															
TRENCHING & BACKFILL	1200	LF	—	—	2.0	2400	0.75	900	—	—	3300				
REGULATING STATIONS	2	EA	—	—	300	600	—	—	1000	2000	2600				
NEW HW BOILERS															
TEST & BALANCE	17	EA	—	—	135	2295	—	—	—	—	2295				
TOTAL THIS SHEET											15761				

TØØ95080 ALT1

MONTHLY ENERGY CONSUMPTION - ALTERNATIVE 1
EXISTING EQUIPMENT COMBINED COMPLEX

----- MONTHLY ENERGY CONSUMPTION -----

Month	ELEC	DEMAND	GAS	WATER
	On Peak (kWh)	On Peak (kW)		
			(Therm)	(1000 GL)
Jan	520,560	1,023	122,964	129
Feb	469,624	1,022	98,947	117
March	574,069	1,290	66,786	169
April	619,115	1,350	43,629	384
May	907,854	2,166	1,030	1,172
June	1,066,403	2,507	3,416	1,730
July	1,249,361	2,693	7,595	2,269
Aug	1,208,242	2,655	6,638	2,115
Sept	946,409	2,401	364	1,340
Oct	679,523	1,407	35,425	499
Nov	551,683	1,281	70,091	158
Dec	546,322	1,266	84,152	149
Total	9,339,166	2,693	541,037	10,230

Building Energy Consumption = 235,380 (Btu/Sq Ft/Year)
Source Energy Consumption = 417,725 (Btu/Sq Ft/Year)

Floor Area = 365,275 (Sq Ft)

MONTHLY ENERGY CONSUMPTION - ALTERNATIVE 2
MODULAR BOILERS FOR 610,620,621 COMBINED

----- MONTHLY ENERGY CONSUMPTION -----

Month	ELEC	DEMAND	GAS	WATER
	On Peak (kWh)	On Peak (kW)		
			(Therm)	(1000 G1)
Jan	522,594	1,025	119,727	129
Feb	471,462	1,025	97,020	117
March	575,556	1,291	65,908	169
April	620,218	1,350	43,042	384
May	907,854	2,166	1,030	1,172
June	1,063,416	2,435	403	1,719
July	1,243,055	2,621	650	2,249
Aug	1,201,801	2,583	498	2,095
Sept	946,409	2,401	364	1,340
Oct	680,517	1,407	35,014	499
Nov	553,264	1,281	68,959	158
Dec	548,110	1,266	82,602	149
Total	9,334,257	2,621	515,220	10,179

Building Energy Consumption = 228,266 (Btu/Sq Ft/Year)
Source Energy Consumption = 410,148 (Btu/Sq Ft/Year)

Floor Area = 365,275 (Sq Ft)

MONTHLY ENERGY CONSUMPTION - ALTERNATIVE 1

TESTING EQUIPMENT

----- MONTHLY ENERGY CONSUMPTION -----

Month	ELEC On Peak (kWh)	DEMAND On Peak (kW)	GAS On Peak (Therm)	WATER (1000 G1)	GAS DMND On Peak (Thrm/hr)
Jan	520,634	1,126	105,191	190	168
Feb	483,769	1,126	83,136	162	154
March	552,402	1,187	54,577	207	108
April	577,471	1,252	34,589	347	86
May	813,195	1,870	1,079	1,031	28
June	927,743	2,106	0	1,466	0
July	1,075,281	2,273	1,022	1,895	51
Aug	1,039,639	2,241	0	1,759	0
Sept	833,706	1,979	395	1,169	20
Oct	617,912	1,287	27,383	437	74
Nov	526,322	1,180	56,895	193	113
Dec	541,329	1,168	68,285	195	127
Total	8,509,402	2,273	432,554	9,052	168

Building Energy Consumption = 227,094 (Btu/Sq Ft/Year)
Source Energy Consumption = 416,723 (Btu/Sq Ft/Year)

Floor Area = 318,361 (Sq Ft)

USE FOR NEW BOILER BURNERS

MONTHLY ENERGY CONSUMPTION - ALTERNATIVE 3
NEW BOILER BURNERS DERATED TO 22000 LB-H

----- MONTHLY ENERGY CONSUMPTION -----

Month	ELEC	DEMAND	GAS	WATER	GAS DMND
	On Peak (kWh)	On Peak (kW)	On Peak (Therm)		On Peak (Thrm/hr)
Jan	511,676	1,114	50,208	146	83
Feb	475,678	1,114	38,343	122	75
March	543,444	1,187	22,807	163	47
April	569,249	1,252	13,947	310	35
May	813,130	1,846	822	1,040	11
June	928,625	2,106	138	1,470	5
July	1,074,559	2,273	409	1,891	20
Aug	1,039,085	2,241	0	1,756	0
Sept	832,938	1,979	302	1,169	8
Oct	610,505	1,287	11,063	405	30
Nov	517,652	1,180	23,940	151	51
Dec	532,371	1,154	29,676	151	59
Total	8,448,912	2,273	191,656	8,773	83

Building Energy Consumption = 150,778 (Btu/Sq Ft/Year)
Source Energy Consumption = 335,127 (Btu/Sq Ft/Year)

Floor Area = 318,361 (Sq Ft)

USE FOR NEW BOILER BURNER

installation: IRWIN ARMY COMMUNITY HOSPITAL, FT. RILEY, KANSAS

project: ENERGY ENGINEERING ANALYSIS PROGRAM (EEAP)

project number _____
temporary: _____ program year _____

permanent: _____ category code _____

point of contact:

user
name Maj. James Fletcher date 28 August 1991

title Chief of Logistics phone (913) 239-7207
autovon _____

dfae
name Larry Stillwagon date 20 August 1991

title Base Energy Officer phone (913) 239-2371
autovon _____

engineer district
name Robert Miller date 28 August 1991

title Project Manager phone (816) 426-2782
autovon _____

other (A-E)
name Randall D. Frymire date 27 August 1991

title Project Manager phone (816) 931-2200
autovon _____

reviewed by:

installation facility engineer
name Larry Stillwagon date 28 August 1991

title Base Energy Officer phone (913) 239-2371
autovon _____

approved by:

macom engineer
name _____ date _____

title _____ phone _____
autovon _____

project development brochure, PDB-1

facility

IRWIN ARMY COMMUNITY HOSPITAL
FT. RILEY, KANSAS

project coordinator for using service

LARRY STILLWAGON
BASE ENERGY OFFICER

functional requirements summary, PDB-1

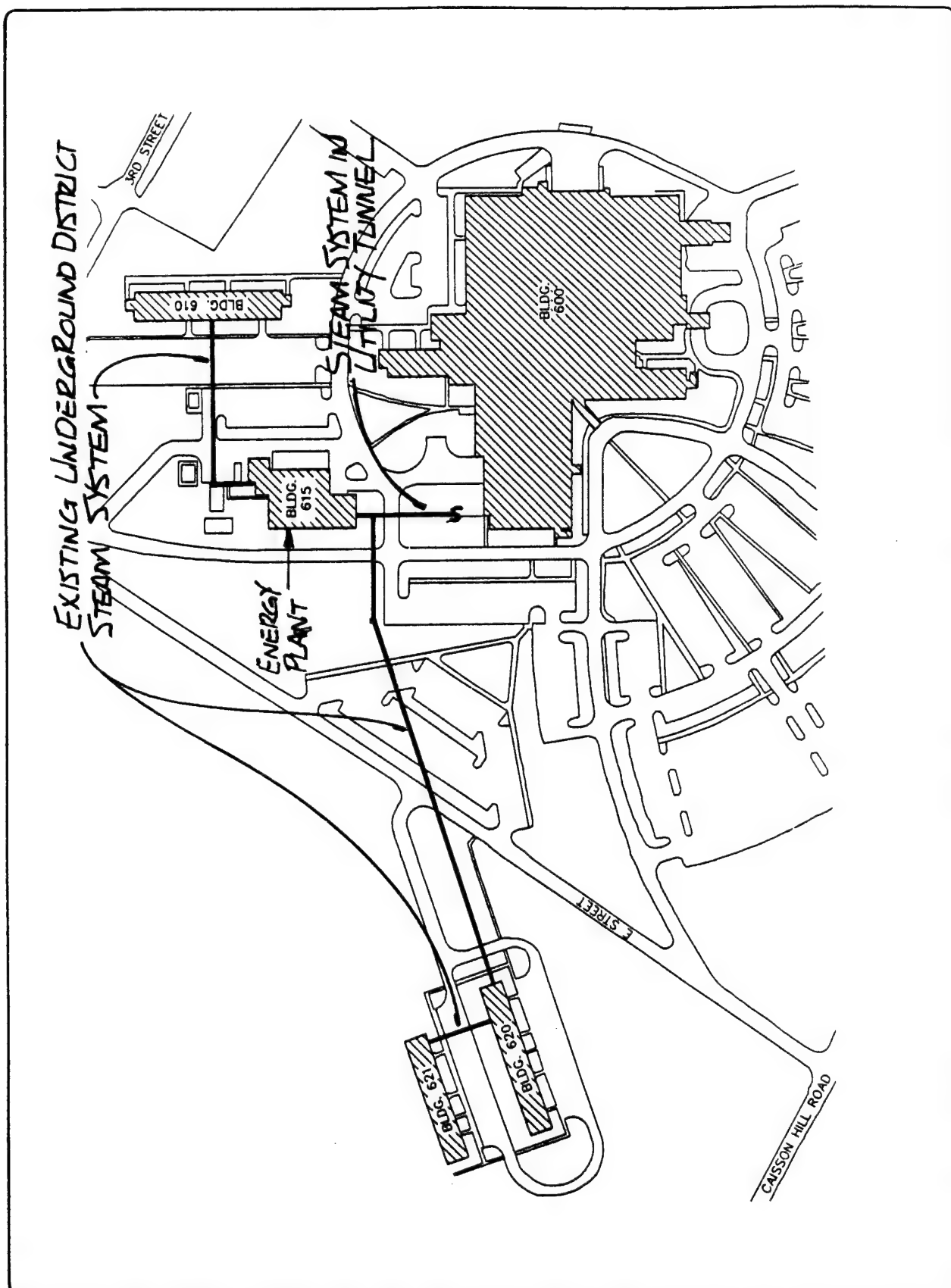
OBJECTIVE

The objective of this project is to install new gas fired, high-efficiency modular boilers in each of three buildings (Nos. 610, 620, and 621) to heat domestic hot water and building water for heating and to install high-turndown gas-fired, high-efficiency burners in the hospital energy plant boilers for the reduced heating requirements of the hospital.

The modular boilers in Buildings 610, 620, and 621 would replace the present underground district steam system to these buildings generated at the hospital energy plant and reduce the gas consumption with the high-efficiency boilers and reduced heat loss through piping and heat exchangers.

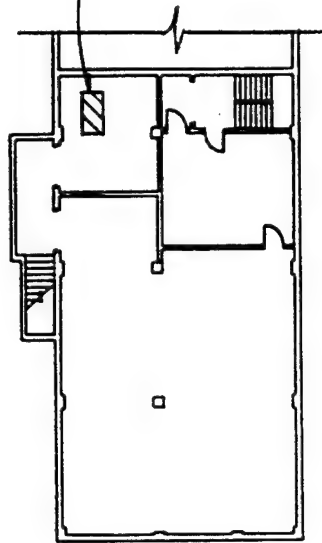
The high-turndown burners will reduce gas consumption due to a higher efficiency at low part loads than the older boilers currently in use.

functional requirements summary, PDB-1

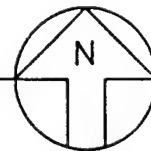


facilities requirements sketch, PDB- 1/2

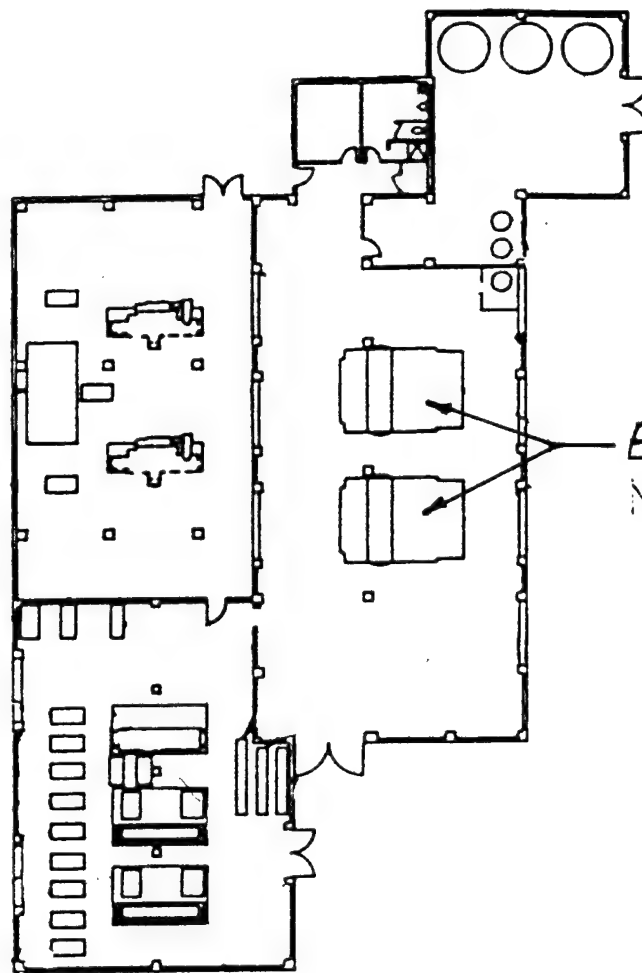
NEW MODULAR HIGH-
EFFICIENCY BOILERS



BUILDING 610
BASEMENT FLOOR PLAN

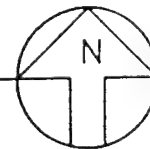


facilities requirements sketch, PDB- 1/2

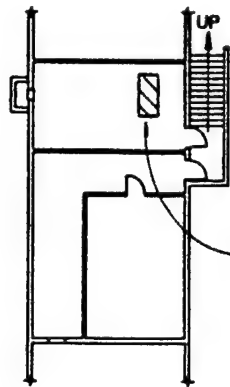


EXISTING BOILERS w/
NEW BURNERS

ENERGY PLANT FLOOR PLAN



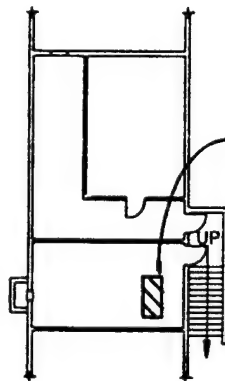
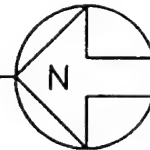
facilities requirements sketch, PDB- 1/2



NEW MODULAR HIGH-EFFICIENCY BOILERS

BUILDING 620

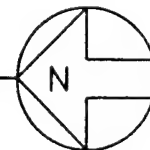
BASEMENT FLOOR PLAN



NEW MODULAR HIGH-EFFICIENCY BOILERS

BUILDING 621

BASEMENT FLOOR PLAN



facilities requirements sketch, PDB- 1/2

A. SPECIAL CONSIDERATIONS

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
A-1	Cost estimates for each primary and supporting facility	R			
A-2	Telecommunications system coordination with USACC and authorization for exceptions	NR			
A-3	Coordination with state and local governmental requirements (blind vendors, medical facilities, construction and operating permits, clearinghouse coordination, etc.)	NR			
A-4	Assignment of airspace	NR			
A-5	Economic analysis of alternatives	NR			
A-6	Approval for new starts	NR			
A-7	International balance of payments (IBOP) coordination with U.S. European command and NATO—overseas cost estimates and comparables (include rate of exchange used in estimates)	NR			
A-8	Impact on historic places—on site survey by authorized archeologist and coordination with state historic preservation officer and advisory council on historic preservation	NR			
A-9	Exceptions to established criteria	NR			
A-10	Coordination with various staff agencies (Provost Marshall-physical security, etc.)	NR			
A-11	Identification of related or support projects (so projects can be coordinated)	NR			
A-12	Required completion date	NR			
Other Special Considerations (List and number items)		NR			

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COMMENT ATTACHED — Significant information summarized or explained and attached.

DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

***BY WHOM** (Check and insert appropriate letter)

A — DFAE

B — Using Service

C — Construction Service

D — Designer

E — Other (Check Comments Attached and explain)

documentation checklist

B. SITE DEVELOPMENT

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
B-1	Consultation with the District Office to determine and evaluate flood plain hazards	NR			
B-2	Preparation, submission, and/or approval of new				
(A)	General Site Plan				
(B)	Annotated General Site Plan				
(C)	Sketch Site Plan				
(D)	Facilities Requirements Sketch				
B-3	Preparation of				
(A)	Site Survey				
(B)	Subsoil Information				
B-4	Approval by Department of Defense Explosive Safety Board (DDESB) for Safety Site Plan	NR			
	Other Site Development Considerations (List and number items)	NR			

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documentation checklist

DA FORM 5023-B-R, Feb 82

C. ARCHITECTURAL & STRUCTURAL

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
C-1	Reconciliation with troop housing programs and requirements	NR			
C-2	Evaluation of existing facilities (including degree of utilization)	NR			
C-3	Approval for removal and relocation of existing useable facilities	NR			
C-4	Evaluation of off-post community facilities	NR			
C-5	Storage and maintenance facilities (including nuclear weapons)	NR			
C-6	Coordination hospitals, medical and dental facilities with Surgeon General	NR			
C-7	Coordination of aviation facilities with FAA	NR			
C-8	Coordination air traffic control and navigational aids with USACC	NR			
C-9	Tabulation of types and numbers of aircraft	NR			
C-10	Evaluation of laboratory, research and development, and technical maintenance facilities	NR			
C-11	Coordination chapels with Chief of Chaplains	NR			
C-12	Review food service facilities by USATSA	NR			
C-13	Automated data processing system or equipment approvals—cost analysis when ADP and/or communication centers not co-located with related facilities	NR			
C-14	Coordination postal facilities with U.S. Postal Service Regional Director	NR			
C-15	Laundry and dry cleaning facilities coordination with ASD(I&L)	NR			
C-16	Tenant facilities coordination with installation where sited	NR			
C-17	Facilities for or exposed to explosions, toxic chemicals, or ammunition—review by DDESB (See also Item B-4)	NR			
C-18	Analysis of deficiencies	NR			
C-19	Consideration of alternatives	NR			
C-20	Determination whether occupants will include physically handicapped or disabled persons	NR			
C-21	As-build drawings for alterations or additions	NR			
C-22	Availability of Standard Design or site adaptable designs	NR			
	Other Architectural & Structural (List and number items)	NR			

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documentation checklist

D. MECHANICAL, ELECTRICAL, & UTILITY SYSTEMS

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
D-1	Fuel considerations and cost comparison analysis	NR			
D-2	Energy requirements appraisal (ERA)				
D-3	Conformance with DOD Energy Reduction requirements				
D-4	Evaluation of existing and/or proposed utility systems	NR			
	Other Mechanical and Utility Systems (List and number items)	NR			

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documentation checklist

DA FORM 5023-D-R, Feb 82

E. ENVIRONMENTAL CONSIDERATIONS

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
E-1	Environmental impact assessment	NR			
E-2	EIA conclusions require Environmental Impact Statement	NR			
E-3	Determination of health, environmental or related hazards. Assistance to determine existence of any health, environmental or related hazard may be requested from Aberdeen Proving Ground, MD 21010, the Office of the Surgeon General, Attn: DASG-HCH (Army Environmental Hygiene Agency)				
E-4	Air/water pollution permit, coordination with agencies and compliance with standards at Federal, state and local level				
E-5	Corrective measures associated with Environmental Impact Statements or assessment—list separately and evaluate.				
	Other environmental considerations (list and number items)				

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documentation checklist

DA FORM 5023-E-R, Feb 82

A. SPECIAL CONSIDERATIONS

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
A-1	Factors of risk, restriction or unusual circumstance expected to increase costs beyond applicable area averages	NR			
A-2	Construction phasing requirements	NR			
A-3	Functional support equipment (mechanical, electrical, structural, and security) to be built in				
A-4	Equipment in place and justification				
A-5	Other equipment and furniture (O&MA, OPA) and costs				
A-6	Special studies and tests (hazards analyses, compatibility testing, new technology testing, etc.)				
A-7	Type of construction (permanent, temporary, semi-permanent)				
A-8	Government furnished equipment (quantities, procurement time, availability and special handling and storage requirements). Funds used for procurement.				
	Other special considerations (list and number items)				

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technical data checklist

B. SITE DEVELOPMENT

ITEM		Required or Not Required	To Be Determined	Comment Attached	Document Attached
B-1	Construction restrictions or guidelines pertaining to site access and preferred construction routes				
(A)					
(B)	Airfield clearance, explosive storage, working hours, safety, etc.				
(C)	Facilities and/or functions or adjoining areas (structures, materials, impact)				
B-2	Real estate actions (acquisition, disposal, lease, right-of-way)				
B-3	Demolition/relocation required (data)				
(A)	Special considerations due to explosives/radioactivity/chemical contamination/asbestos emissions/toxic gases				
(B)	Restrictions on disposal of demolished/relocated material including hazardous waste				
B-4	Pavement types and requirements (including traffic surveys and MTMC coordination)				
B-5	Landscape considerations				
(A)	Protection of existing vegetation				
(B)	Stockpile topsoil				
	Other Site Development (List and number items)				

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technical data checklist

C. ARCHITECTURAL & STRUCTURAL

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
C-1	Vibration-producing equipment requiring isolation	-			
C-2	Seismic zone and other design load criteria (typhoon, hurricane, earthquake loads, high or low loss potential)	R	D		
C-3	Protective shelter evaluation and resistant design criteria (conventional/nuclear blast and radiation, chemical/biological)				
C-4	Unusual foundation requirements (pier, pile, caisson, deep foundations, mat, special treatment, permafrost areas, soil bearing)	-			
C-5	Designation and strength of units to be accommodated	-			
C-6	Requirements and data for special design projects	NR			
C-7	Unusual floor and roof loads (safes, equipment)	NR			
C-8	Security features (arms rooms, vaults, interior secure areas)	NR			
	Other Architectural & Structural (List and number items)	NR			

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technical data checklist

D. MECHANICAL, ELECTRICAL, & UTILITY SYSTEMS

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
D-1	Special mechanical requirements or considerations (elevator, crane, hoist, etc.)	R			
D-2	Special peak usage periods and peak leveling techniques	NR			
D-3	Maintenance considerations (accessibility of equipment, compatibility with existing equipment)	R	C		
D-4	Plumbing—availability, general system type and characteristics (proposed and/or existing, incl. compressed air and gas)	R	D		
D-5	Heating—availability, general system type and characteristics (proposed and/or existing)	R	D		
D-6	Ventilating, air condition/refrigeration—availability, general system type and characteristics (proposed and/or existing)	R	C		
D-7	Electrical—availability, general system type and characteristics incl. airfield lighting, communication, etc. (proposed and/or existing)	R	C		
D-8	Water supply/waste treatment—availability, general system type and characteristics (proposed and/or existing)	R	C		
D-9	Energy requirements/fuel conversion (sources, availability, loads, types of fuel, etc.)	NR			
D-10	Solar energy evaluation	NR			
	Other Mechanical & Utility Systems (List and number items)	NR			

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technical data checklist

E. ENVIRONMENTAL CONSIDERATIONS

ITEM		Required or Not Required	* To Be Determined	Comment Attached	Document Attached
E-1	Waste water treatment, air quality, and solid waste disposal criteria Other Environmental Considerations (List and number items)	NR			

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technical data checklist

F. FIRE PROTECTION

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
F-1	Special fire protection systems or features (detection and suppression equipment, hazards, etc.)	NR			
	Other Fire Protection Considerations (List and number items)				

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

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technical data checklist

COST ESTIMATE ANALYSIS										INVOITATION/CONTRACTOR		EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 5-800-2; the proponent agency is USACE.										CODE (Check one) <input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C		January 1992		April 1992	
PROJECT Irwin Army Community Hospital - EEAP										DRAWING NO. BUENES/MDD. BOILER		SHEET 1 OF 6		SHEETS	
LOCATION Fort Riley, Kansas										ESTIMATOR KAB		CHECKED BY R. D. Frymire			
TASK DESCRIPTION	QUANTITY		MH	LABOR		EQUIPMENT		MATERIAL		SHIPPING					
	NO. OF UNITS	UNIT MEAS		TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	UNIT WT	TOTAL WT			
SHEET 2 OF 6															
SHEET 3 OF 6															
SHEET 4 OF 6															
SHEET 5 OF 6															
SHEET 6 OF 6															
SUBTOTAL															
SUBCONTRACTOR OH @ 15%															
SUBCONTRACTOR PROFIT @ 10%															
SUBTOTAL															
GEN. CONTRACTOR OH @ 15%															
GEN. CONTRACTOR PROFIT @ 10%															
SUBTOTAL															
CONTINGENCIES @ 5.5%															
CONSTRUCTION COST															
SIDH @ 6%															
TOTAL THIS SHEET															

COST ESTIMATE ANALYSIS										EFFECTIVE PRICING DATE		DATE PREPARED			
For use of this form, see TM 5-800-2; the proponent agency is USACE.										January 1992		April 1992			
PROJECT		LOCATION		INVOITATION/CONTRACTOR		CODE (Check one)		DRAWING NO.		SHEET		OF		SHEETS	
Irwin Army Community Hospital - EEAP		Fort Riley, Kansas		<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C		<input type="checkbox"/> OTHER		BURNERS / MOD. BOILER		3		6		6	
ESTIMATOR		LABOR		EQUIPMENT		MATERIAL		CHECKED BY		TOTAL		UNIT WT		TOTAL WT	
WAB		UNIT PRICE COST UNIT PRICE COST UNIT PRICE COST UNIT PRICE COST		UNIT PRICE COST UNIT PRICE COST UNIT PRICE COST UNIT PRICE COST		UNIT PRICE COST UNIT PRICE COST UNIT PRICE COST UNIT PRICE COST		R. D. Frymire		5000					
ENERGY PLANT															
GENERAL DEMOLITION		1		LS											
PACKAGE 25,000 MBH															
BURNERS		2		EA		13,000		26,000		1000		5745		142,900	
GAS TRAIN INSTALLATION		1		LS											
BOILER MODIFICATIONS		1		LS										3500	
START-UP/CHECK-OUT		1		LS										10,000	
TOTAL THIS SHEET														111,400	

COST ESTIMATE ANALYSIS										INVOITATION/CONTRACTOR		EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 5-800-2; the proponent agency is USACE.										January 1992		April 1992			
PROJECT Irwin Army Community Hospital - EEAP										DRAWING NO. / MOD. BOILER		SHEET 3 OF 6 SHEETS			
LOCATION Fort Riley, Kansas										ESTIMATOR BK6		CHECKED BY R. D. Frymire			
TASK DESCRIPTION	QUANTITY		MH	LABOR		EQUIPMENT		MATERIAL		TOTAL	SHIPPING				
	NO. OF UNITS	UNIT MEAS		UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST		UNIT WT	TOTAL WT			
GAS FIRED BOILERS															
BUDG. 6010															
HEAT	4	EA		1050	4200			2805	11220	15420					
DOM. HW	2	EA		805	1730			2245	4490	6220					
BUDG. 6020															
HEAT	3	EA		780	2340			1730	5190	7530					
DOM. HW	1	EA		800	800			1949	1949	2769					
BUDG. 6021															
HEAT	3	EA		780	2340			1730	5190	7530					
DOM. HW	1	EA		780	780			1720	1720	2500					
TOTAL THIS SHEET										41969					

COST ESTIMATE ANALYSIS										EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 5-800-2; the proponent agency is USACE.										January 1992		April 1992	
PROJECT		INVOITATION/CONTRACTOR		CODE (Check one)		DRAWING NO.		SHEET		OF		SHEETS	
Irwin Army Community Hospital - EEAP		X A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/>		BURNERS / MOD BOILER		4		6					
LOCATION		ESTIMATOR		OTHER		BKC		CHECKED BY		R. D. Frymire			
Fort Riley, Kansas													
TASK DESCRIPTION	QUANTITY		MH	TOTAL HRS	LABOR		EQUIPMENT		MATERIAL		TOTAL	SHIPPING	
	NO. OF UNITS	UNIT MEAS			UNIT PRICE	COST	UNIT PRICE	COST	UNIT WT	TOTAL WT			
BLR BLUE & RHTTINGS													
BLDG. 610 (4')	150	LF	—	—	9.50	—	—	—	13.50	3005	3450		
BLDG. 620 (4')	100	LF	—	—	9.50	—	—	—	13.50	1350	2300		
BLDG. 601 (4')	100	LF	—	—	9.50	—	—	—	13.50	1350	2300		
MIS. PIPING W/INSUL.													
BLDG 610	1	LS	—	—	—	—	—	—	—	640	2350		
BLDG 600	1	LS	—	—	—	—	—	—	—	430	1570		
BLDG 601	1	LS	—	—	—	—	—	—	—	430	1570		
MOD. BOILER CONTROLS	3	EA	—	—	—	—	—	—	4525	13575	13575		
TOTAL THIS SHEET											27115		

COST ESTIMATE ANALYSIS										EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 5-800-2; the proponent agency is USACE.										January 1992		April 1992	
PROJECT Irwin Army Community Hospital - EEAP										DRAWING NO. BURNERS / MDP BOILER		SHEET 5 OF 6 SHEETS	
LOCATION Fort Riley, Kansas										ESTIMATOR BKC		CHECKED BY R. D. Frymire	
TASK DESCRIPTION		QUANTITY		MH		LABOR		EQUIPMENT		MATERIAL		SHIPPING	
		NO. OF UNITS	UNIT MEAS	UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	UNIT WT	TOTAL WT
WATER HTR W/ PUMP													
BLDG GLO (780 GAL)		1	EA	—	—	213	213	—	—	9476	9476	9689	
BLDG GLO (300 GAL)		1	EA	—	—	138	138	—	—	6980	6980	7118	
BLDG GLO (300 GAL)		1	EA	—	—	105	105	—	—	5002	5002	5107	
GAS PIPING & FITTINGS													
BLDG GLO (1")		400	LF	—	—	3.25	1300	—	—	3.7	1480	2780	
BLDG GLO (2")		1000	LF	—	—	3.5	3500	—	—	4.21	4210	7710	
BLDG GLO (1")		300	LF	—	—	3.25	975	—	—	3.7	1110	2085	
EXPANSION TANKS		3	EA	—	—	35	105	—	—	1040	3120	3225	
TOTAL THIS SHEET												37714	

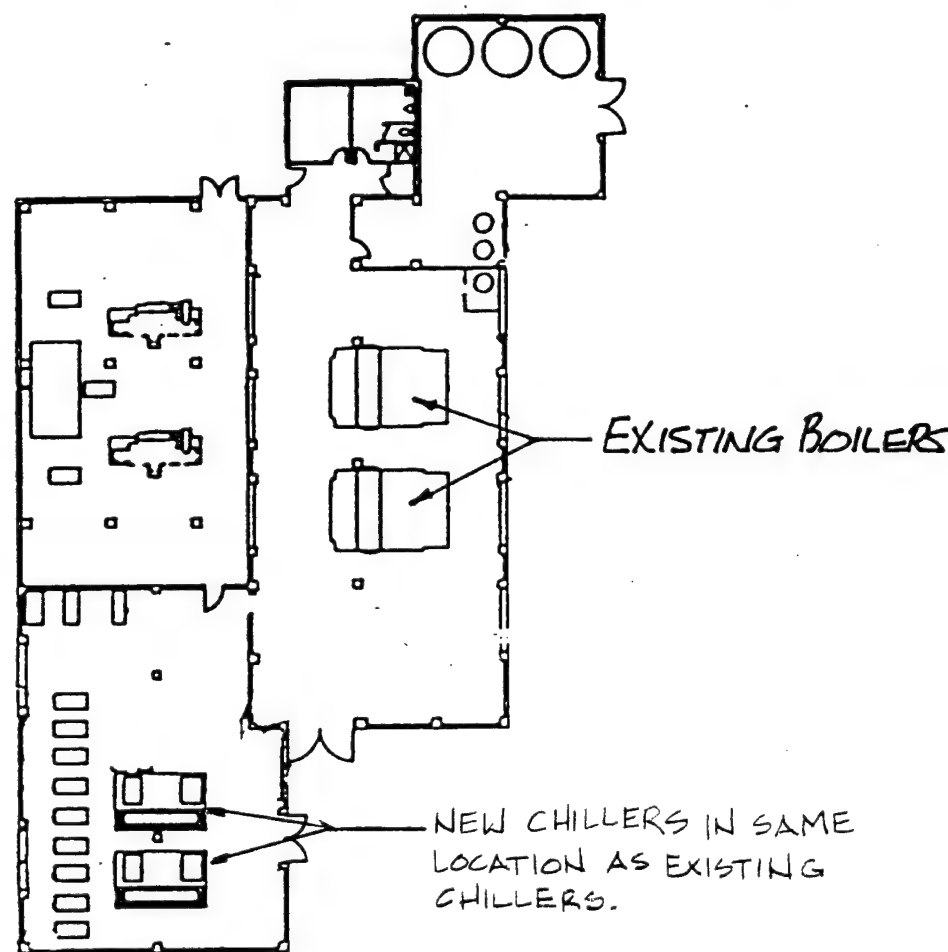
COST ESTIMATE ANALYSIS										INVOITATION/CONTRACTOR		EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 5-800-2; the proponent agency is USACE.										January 1992		April 1992			
PROJECT Irwin Army Community Hospital - EEAP										CODE (Check one) <input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C		DRAWING NO. BURNETT/MOD. ROILER		SHEET 6 OF 6 SHEETS	
LOCATION Fort Riley, Kansas										<input type="checkbox"/> OTHER		ESTIMATOR BKC		CHECKED BY R. D. Frymire	
TASK DESCRIPTION	QUANTITY		MH	LABOR		EQUIPMENT		MATERIAL		TOTAL	SHIPPING				
	NO. OF UNITS	UNIT MEAS		UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST		UNIT WT	TOTAL WT			
BUDG 610s 600 & 621	3	EA	—	1000	3000	—	—	—	—	3000					
DEMD. OF EQUIP. RM.															
MIS. ELECT.	3	EA	—	350	1050	—	—	150	450	1500					
CIRC. PUMPS															
#610	1	EA	—	92	92	—	—	1070	1070	1162					
#620	1	EA	—	92	92	—	—	860	860	952					
#621	1	EA	—	92	92	—	—	860	860	952					
NEW GASLINE															
TRENCHING & BACKFILL	1200	LF	—	2.0	2400	0.75	900	—	—	3300					
REGULATING STATIONS	2	EA	—	300	600	—	—	1000	2000	2600					
NEW HW BOLLERS															
TEST & BALANCE	17	EA	—	135	2295	—	—	—	—	2295					
TOTAL THIS SHEET										15761					

5. CHILLER REPLACEMENT

1. COMPONENT ARMY		FY 19 <u>95</u> MILITARY CONSTRUCTION PROJECT DATA		2. DATE 19 APR 1992 14 APR 1992	
3. INSTALLATION AND LOCATION Fort Riley Kansas			4. PROJECT TITLE ECIP Chiller Replacement		
5. PROGRAM ELEMENT	6. CATEGORY CODE 510 10	7. PROJECT NUMBER 40474	8. PROJECT COST (\$000) 860		
9. COST ESTIMATES					
ITEM	U/M	QUANTITY	UNIT COST	COST (\$000)	
PRIMARY FACILITY Chiller Replacement	EA	2	349026	698 (698)	
SUPPORTING FACILITIES Design Cost	LS	---	---	42 (42)	
ESTIMATED CONTRACT COST				740	
CONTINGENCY PERCENT (10.0%)				74	
SUBTOTAL				814	
SUPERVISION, INSPECTION & OVERHEAD (6.00%)				49	
CATEGORY E EQUIPMENT				(0)	
TOTAL REQUEST				863	
TOTAL REQUEST (ROUNDED)				860	
INSTALLED EQUIPMENT-OTHER APPROPRIATIONS				(0)	
10. DESCRIPTION OF PROPOSED CONSTRUCTION The project includes removing the three existing 200 ton steam centrifugal chillers and their associated condensers, pumps and accessories. Install two new gas engine-driven chillers with associated piping, pumps, expansion tanks, controls and electrical. One of the two chillers will be sized to provide cooling for the winter load. The heat recovered from the engine is used to preheat make-up water to the boiler and for reheat system hot water.					
11. REQUIREMENT: PROJECT: Replace the three 200 ton steam driven centrifugal chillers with two larger gas engine-driven chillers with one sized for just the winter load. Install new gas piping, pumps and accessories. REQUIREMENT: This project is required to reduce the chiller system inefficiencies, large annual maintenance costs, and reduce summer peak electrical demand costs.					


1. COMPONENT ARMY	FY 19 <u>95</u> MILITARY CONSTRUCTION PROJECT DATA		2. DATE 19 APR 1992 14 APR 1992									
3. INSTALLATION AND LOCATION Fort Riley Kansas												
4. PROJECT TITLE ECIP Chiller Replacement		5. PROJECT NUMBER 40474										
<p>CURRENT SITUATION:</p> <p>The existing 200 ton steam centrifugal chillers are past their useful life and are a continuous maintenance and repair problem. Under present operation the two new 475 ton electric centrifugal chillers are sequenced on first. The steam chillers are mainly used to handle the additional summer load even though they are smaller than the two TRANE electric centrifugal chillers. The present off-peak season load is provided by a large capacity chiller operating at low partial load which decreases the chiller efficiency.</p> <p>IMPACT IF NOT PROVIDED:</p> <p>Failure to approve this project will result in continued operating inefficiencies and large annual repair costs to the three steam centrifugal chillers. Great inconvenience is now caused while the existing chillers are down for repairs.</p> <p>ADDITIONAL:</p> <p>This project complies with the scope and design criteria of CEHSU-FU-M, Energy Conservation Investment Program (ECIP) Guidance, that was in effect June 1991. The individual project has a Discounted Savings Ratio (SIR) of 1.86 and a simple payback of 8.93 years. The implementation of this project will save 2,464 MBTU/Yr and \$85,166/Yr.</p> <p>Project validation will be through the use of metering gas flow and metering electric consumption at the Energy Plant. Comparison of total annual gas and electric consumption along with boiler/chiller operating logs and engineering calculations will be utilized.</p> <table border="0"> <tr> <td>ESTIMATED CONSTRUCTION START:</td> <td>APR 1995</td> <td>INDEX: 1992</td> </tr> <tr> <td>ESTIMATED MIDPOINT OF CONSTRUCTION:</td> <td>OCT 1995</td> <td>INDEX: 2029</td> </tr> <tr> <td>ESTIMATED CONSTRUCTION COMPLETION:</td> <td>APR 1996</td> <td>INDEX: 2055</td> </tr> </table>				ESTIMATED CONSTRUCTION START:	APR 1995	INDEX: 1992	ESTIMATED MIDPOINT OF CONSTRUCTION:	OCT 1995	INDEX: 2029	ESTIMATED CONSTRUCTION COMPLETION:	APR 1996	INDEX: 2055
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ESTIMATED MIDPOINT OF CONSTRUCTION:	OCT 1995	INDEX: 2029										
ESTIMATED CONSTRUCTION COMPLETION:	APR 1996	INDEX: 2055										

1. COMPONENT ARMY	FY 19⁹⁵ MILITARY CONSTRUCTION PROJECT DATA	2. DATE 1/16/92
3. INSTALLATION AND LOCATION Irwin Army Community Hospital Fort Riley, Kansas		
4. PROJECT TITLE Chiller Replacement (ECIP)		5. PROJECT NUMBER



EXISTING BOILERS

NEW CHILLERS IN SAME LOCATION AS EXISTING CHILLERS.

ENERGY PLANT FLOOR PLAN


INTRODUCTION

This project concerns replacing the three existing 200 ton capacity steam-driven centrifugal chillers. The existing steam-driven chillers are now 36 years old which is approximately 11 years beyond their projected useful life. The existing chillers are a continuous maintenance and repair problem both in time and money. Due to the undependable state of the existing steam centrifugal chillers, they are not used to base load the plant. Because of this facility's need for a minimum amount of year-round cooling, it is generally more efficient to base load with the smaller capacity chillers first to reduce the part load hours of operation. Chillers are more efficient when loaded at peak capacity. In this project, one of the two new chillers would be sized to be used in the off-peak season to closely match the winter load required by the Nursery/Delivery and Surgery air handling units which require mechanical cooling all year.

Three different types of chillers were reviewed but only the gas-fired engine-driven units with heat recovery had a payback of 10 years or less. The other two chiller options studied were electric centrifugal and direct gas-fired absorption with heat recovery. This project deals only with the gas-fired engine-driven chiller.

Due to available unit sizes one 250 ton and one 500 ton unit would be installed to replace the three existing 200 ton machines. From the manufacturer's data the 250 ton chiller full load gas input is 1,785 MBH and the 500 ton chiller is 3,570 in both the cooling and heat recovery mode.

The recoverable heat from the engine cooling jacket and exhaust manifold for the 250 ton unit is 850 MBH and for the 500 ton unit is 1,700 MBH. The heat available for recovery would be utilized to preheat boiler feed water and to provide heat for the hospital building reheat system. To recover this heat, heat exchangers are furnished with the chillers and new circulating pumps, piping and valves will be installed.

ASSUMED CONDITIONS

Gas Cost = 3.7 \$/MCF

Electric Cost = 0.038 \$/KWH

Annual maintenance and repair cost for new chillers is \$4,300 for 250 ton unit and \$6,700 for 500 ton unit.

Gas engine-driven chiller engines are estimated to last 20,000 equivalent full load hours before replacement is required.

Estimated replacement cost is \$6,000/engine.

Equivalent full load hours for 250 ton unit are estimated at 5,500/year and for 500 ton unit at 2,200/year.

Annual repair and maintenance cost for existing chillers is \$15,000 or \$5,000 each.

Replacement savings = The two Carrier steam chillers are already 11 years beyond the 25 year useful life estimated by ASHRAE. A replacement cost in year one of the study is included as a nonrecurring savings. The York steam centrifugal chiller was installed 23 years ago. The service life given by ASHRAE is 25 years. The chiller would be replaced in year three of the study.

LIFE CYCLE COST ANALYSIS SUMMARY

ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: Fort Riley, Ks. REGION NO.: 7 PROJECT NO.: 40474
 PROJECT TITLE: Chiller Replacement FISCAL YR.: 1995
 DISCRETE PORTION NAME: Replace Chillers
 ANALYSIS DATE: 4-15-92 ECONOMIC LIFE 25 YEARS PREPARED BY: RDF

1. INVESTMENT

A. CONSTRUCTION COST	\$	<u>692538</u>	
B. SIOH	\$	<u>41553</u>	
C. DESIGN COST	\$	<u>41553</u>	
D. SALVAGE VALUE	-\$	<u>15221</u>	
E. TOTAL INVESTMENT (1A + 1B + 1C - 1D)			\$ <u>760423</u>

2. ENERGY SAVINGS (+) / COST (-)

ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	COST \$/MBTU/YR(1)	SAVINGS MBTU/YR(2)	ANNUAL \$ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	\$ <u>11.13</u>	<u>5391</u>	\$ <u>60,002</u>	<u>15.04</u>	\$ <u>902428</u>
B. DIST	\$ <u> </u>	<u> </u>	\$ <u> </u>	<u> </u>	\$ <u> </u>
C. RESID	\$ <u> </u>	<u> </u>	\$ <u> </u>	<u> </u>	\$ <u> </u>
D. NG	\$ <u>3.59</u>	<u>-2927</u>	\$ <u>-10,508</u>	<u>18.92</u>	\$ <u>-198810</u>
E. COAL	\$ <u> </u>	<u> </u>	\$ <u> </u>	<u> </u>	\$ <u> </u>
F. TOTAL		<u>2464</u>	\$ <u>49,494</u>		\$ <u>703618</u>

3. NONENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-) \$ 15992
 (1) DISCOUNT FACTOR (TABLE A) 14.68
 (2) DISCOUNTED SAVINGS/COST (3A X 3A1) \$ 234763

B. NONRECURRING SAVINGS (+) / COST (-)

	ITEM	SAVINGS(+) COST(-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR(3)	DISCOUNTED SAVINGS (+) COST (-) (4)
(1)	Replace Chillers	\$ <u>368,000</u>	<u>1</u>	<u>.96</u>	\$ <u>353280</u>
(2)	Chiller Replace	\$ <u>184,000</u>	<u>3</u>	<u>.87</u>	\$ <u>160080</u>
(3)	Engine Replace	\$ <u>-6,000</u>	<u>4</u>	<u>.84</u>	\$ <u>-5040</u>
(4)	Engine Replace	\$ <u>-6,000</u>	<u>8</u>	<u>.70</u>	\$ <u>-4200</u>
(5)	Engine Replace	\$ <u>-12,000</u>	<u>9</u>	<u>.67</u>	\$ <u>-8040</u>
(6)	Engine Replace	\$ <u>-6,000</u>	<u>12</u>	<u>.58</u>	\$ <u>-3480</u>
(7)	Engine Replace	\$ <u>-6,000</u>	<u>16</u>	<u>.49</u>	\$ <u>-2940</u>
(8)	Engine Replace	\$ <u>-12,000</u>	<u>18</u>	<u>.45</u>	\$ <u>-5400</u>
(9)	Engine Replace	\$ <u>-6,000</u>	<u>20</u>	<u>.41</u>	\$ <u>-2460</u>
(10)	Engine Replace	\$ <u>-6,000</u>	<u>24</u>	<u>.34</u>	\$ <u>-2040</u>
	TOTAL	\$ <u>492,000</u>			\$ <u>479760</u>

C. TOTAL NONENERGY DISCOUNTED SAVINGS (+) / COST (-) (3A2 + 3BD4) \$ 714523

D. PROJECT NONENERGY QUALIFICATION TEST

(1) 25% MAX NONENERGY CALC (2F5 X .33) \$ 232194

a. IF 3D1 IS = OR > 3C GO TO ITEM 4

b. IF 3D1 IS < 3C CALC S1R = (2F5 + 3D1) / 1E = 1.23

c. IF 3D1b IS = > 1 GO TO ITEM 4

d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS $2F3 + 3A + (3B1d / \text{YEARS ECONOMIC LIFE})$ \$ 85,166

5. TOTAL NET DISCOUNTED SAVINGS (2F5 + 3C) \$ 1418140

6. DISCOUNTED SAVINGS RATIO (IF < 1 PROJECTS DOES NOT QUALIFY) (SIR) = (5/1E) = 1.86

7. SIMPLE PAYBACK PERIOD (ESTIMATED YEARS) SPB = 1E/4 8.93



MASSAGLIA-NEUSTROM-BREDSON, INC.
CONSULTING ENGINEERS

JOB Irwin EEAP - Ft. Riley, Kansas

SHEET NO. _____ OF _____

CALCULATED BY MM DATE 4-1992

CHECKED BY RDF DATE 4-1992

JOB NO. 5080

NEW ENGINE DRIVEN CHILLERS

INSTALL ONE 230 TON GAS FIRED ENGINE DRIVEN CHILLER AND ONE 460 TON GAS FIRED ENGINE DRIVEN CHILLER WITH HEAT RECOVERY. THE CHILLER PLANT SEQUENCE IS AS FOLLOWS:

1. NEW 230 TON , 1.69 MCF INPUT , 850 MBH RECOVERY
- 2 NEW 460 TON , 3.4 MCF INPUT , 1700 MBH RECOVERY
3. EXISTING 475 TON , 466 KW INPUT
- 4 EXISTING 475 TON , 466 KW INPUT

THE ENERGY USED BY THE HOSPITAL ONLY AS IT NOW OPERATES WAS CALCULATED USING THE TRANE "TRACE" PROGRAM IN FILE T015080 ALTERNATIVE 1. THE 3 EXISTING STEAM DRIVEN 200 TON CHILLERS WERE REPLACED BY THE TWO NEW CHILLERS IN ALTERNATIVE 2.

THE HEAT RECOVERY AVAILABLE FROM THE NEW CHILLERS IS USED TO PREHEAT 20 GPM OF BOILER FEEDWATER FROM 195°F TO 225°F AND HEAT 6 GPM OF BOILER MAKEUP WATER FROM 60°F TO 225°F. ANY ADDITIONAL HEAT IS REJECTED TO THE TERMINAL REHEAT SYSTEM IN THE 1975 ADDITION. THE TOTAL AMOUNT OF HEAT RECOVERY AVAILABLE FROM THE CHILLERS IS 2550 MBH. THE TOTAL AMOUNT OF HEAT RECOVERY UTILIZED IS

$$20 \text{ GPM} \times (225 - 195^\circ\text{F}) \times 500 = 300$$

$$6 \text{ GPM} \times (225 - 60^\circ\text{F}) \times 500 = 495$$

$$\text{TERMINAL REHEAT PEAK LOAD} = \frac{1700}{2495 \text{ MBH}}$$

MNB

MASSAGLIA-NEUSTROM-BREDSON, INC.
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SHEET NO. _____ OF _____

CALCULATED BY MM DATE 4-1992

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JOB NO. 5080

CONTINUED

THEREFORE 98% OF AVAILABLE HEAT RECOVERY
CAN BE USED.

THE RECOVERY HEATING WATER LOOP WILL BE
PIPED IN PARALLEL WITH THE EXISTING
HEAT EXCHANGER FOR BOILER HEATING BACKUP.

BASED ON THE TRACE PROGRAM OUTPUT THE
DIFFERENCE IN ELECTRICAL ENERGY CONSUMPTION
IS AS FOLLOWS:

ELECTRICAL FROM PAGES 10 & 11.

TØ115080	ALT 1	8414952	
TØ115080	ALT 2	<u>6835379</u>	
		1,519,573	KWH

MONTHLY ELECTRICAL CONSUMPTION
 T0115080 ALTERNATE 1
 EXISTING EQUIPMENT

MONTH	ELEC KWH	ELEC KW
JAN	540,643	1,096
FEB	485,716	1,096
MAR	546,262	1,185
APR	548,104	1,235
MAY	800,720	1,839
JUN	922,004	2,108
JUL	1,069,322	2,272
AUG	1,034,951	2,242
SEP	822,078	1,978
OCT	589,348	1,274
NOV	520,457	1,178
DEC	535,347	1,166
TOTAL	8,414,952	2,272

* USE FOR ELECTRICAL CONSUMPTION AND DEMAND SAVINGS.

MONTHLY ELECTRICAL CONSUMPTION
 T0115080 ALTERNATE 2
 ENGINE DRIVEN CHILLERS

MONTH	ELEC KWH	ELEC KW
JAN	489,153	985
FEB	441,597	985
MAR	494,032	1,036
APR	481,734	1,133
MAY	627,350	1,341
JUN	679,873	1,741
JUL	757,823	1,811
AUG	753,348	1,799
SEP	637,992	1,675
OCT	515,887	1,133
NOV	471,297	1,035
DEC	485,295	1,034
TOTAL	6,835,381	1,811

* USE FOR ELECTRICAL CONSUMPTION AND DEMAND SAVINGS



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SHEET NO. _____ OF _____

CALCULATED BY MM DATE 4-1992

CHECKED BY RDF DATE 4-1992

JOB NO. 5080

THE NET ADDITIONAL GAS USED BY INSTALLING
GAS ENGINE DRIVEN CHILLERS
(CHILLER INPUT - HEAT RECOVERY) IS CALCULATED
USING THE BUILDING LOAD PROFILE AND THE
MANUFACTURE PART LOAD PERFORMANCE CURVE.
REFER TO PAGES 13, 14, 15, 16 & 17.

GAS INPUT TO NEW CHILLERS	= 14,005
HEAT RECOVERED BY NEW CHILLERS	= 11,078
ADDITIONAL GAS USED	<u>2,927 MCF</u>

ANNUAL ENERGY SAVING

1,579,573 KWH	$\times 3413 \text{ BTU/KWH}$	=	5391×10^6
- 2927 MCF	$\times 1.031 \times 10^6 \text{ BTU/MCF}$	=	$-2,927 \times 10^6$
			<u>$2,464 \times 10^6 \text{ BTU/YR}$</u>

ANNUAL DOLLAR SAVING

1,579,573 KWH	$\times 0.038 \$/\text{KWH}$	=	60,024
- 2927 MCF	$\times 3.7 \$/\text{MCF}$	=	<u>-10,830</u>
			49,194 \$/YR



MASSAGLIA-NEUSTROM-BREDSON, INC.
CONSULTING ENGINEERS

JOB Irwin EEAP - Ft. Riley, Kansas

SHEET NO. _____

OF _____

CALCULATED BY MM

DATE 4-1992

CHECKED BY RDF

DATE 4-1992

JOB NO. 5080

NEW GAS ENGINE DRIVEN CHILLER NO: 1

RATED TONS

: 230

FULL LOAD GAS INPUT

= 1.69 MCF

OUTPUT ÷ COP = PART LOAD INPUT

% DESIGN LOAD	TONS	OUTPUT BTUH	COP	{ PART LOAD x HOURS ÷ 1.031 } = MCF INPUT x 10 ⁶		
5	63	756,000	1.75	432,000	4385	1837
10	126	1,512,000	2.25	672,000	0	0
15	189	2,268,000	2.1	1,080,000	405	424
20	252- 230	2,760,000	1.7	1,623,529	3970	6252
25						
30						
35						
40						
45						
50						
55						
60						
65						
70						
75						
80						
85						
90						
95						
100						
TOTAL						8,513 MCF



MASSAGLIA-NEUSTROM-BREDSON, INC.
CONSULTING ENGINEERS

JOB Irwin EEAP - Ft. Riley, Kansas

SHEET NO. _____

OF _____

CALCULATED BY MM

DATE 4-1992

CHECKED BY RDE

DATE 4-1992

JOB NO. 5080

NEW GAS ENGINE DRIVEN CHILLER NO 2
RATED TONS : 460
FULL LOAD GAS INPUT : 3.4 MCF

% DESIGN LOAD	TONS	OUTPUT BTUH	COP	$\left\{ \frac{\text{PART LOAD} \times \text{HOURS}}{\text{INPUT}} \div 1.031 \right\} \times 10^6 = \text{MCF}$		
5	0					
10	0					
15	0					
20	252-230 = 22	264,000	1.7	155,294	757	114
25	315-230 = 85	1,020,000	1.7	600,000	273	159
30	377-230 = 147	1,764,000	2.3	766,956	382	284
35	440-230 = 210	2,520,000	2.4	1,050,000	537	547
40	503-230 = 273	3,276,000	2.1	1,560,000	417	631
45	566-230 = 336	4,032,000	2.1	1,920,000	349	650
50	629-230 = 399	4,788,000	1.9	2,520,000	323	789
55	692-230 = 460	5,520,000	1.7	3,247,059	736	2318
60						
65						
70						
75						
80						
85						
90						
95						
100						
TOTAL						5492 MCF



MASSAGLIA-NEUSTROM-BREDSON, INC.
CONSULTING ENGINEERS

JOB Irwin EEAP - Ft. Riley, Kansas

SHEET NO. _____ OF _____

CALCULATED BY BKT DATE 4.10.02

CHECKED BY RDE DATE _____

JOB NO. 5080

NEW GAS ENGINE DRIVEN CHILLER NO. 1

RATED TONS: 230

FULL LOAD RECOVERY: 850,000

BOILER EFF = 78% PIPING LOSS EFF = 90%

<u>% DESIGN LOAD</u>	<u>TONS</u>	<u>% LOADED</u>	<u>{ RECOVER x HRS ÷ .78 ÷ .9 ÷ 1.03 } x 10⁶</u>	<u>MCF</u>
5	63	27	229,500 x 4385	= 390
10	126	55	467,500 x 0	= 0
15	189	82	697,000 x 405	= 390
20	230	100	850,000 x 3970	= 4662
25				
30				
35				
40				
45				
50				
55				
60				
65				
70				
75				
80				
85				
90				
95				
100				
ALL REMAINING HOURS →				
TOTAL				6462 MCF



MASSAGLIA-NEUSTROM-BREDSON, INC.
CONSULTING ENGINEERS

JOB Irwin EEAP - Ft. Riley, Kansas

SHEET NO. _____ OF _____

CALCULATED BY BRT DATE 4.1992

CHECKED BY RDF DATE _____

JOB NO. 5080

NEW GAS ENGINE DRIVEN CHILLER NO. 2

RATED TONS: 460

FULL LOAD RECOVERY 1,700,000

BOILER EFF = 78% PIPING LOSS EFF = 90%

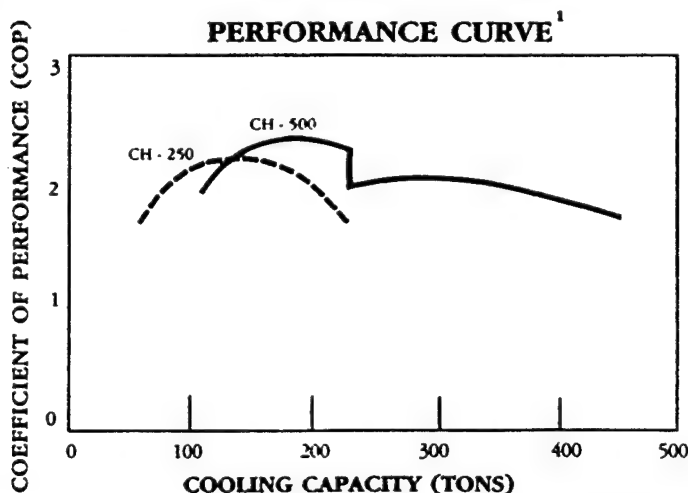
<u>% DESIGN LOAD</u>	<u>TONS</u>	<u>% LOADED</u>	<u>{ RECOVER x HRS ÷ .78 ÷ .9 ÷ 1.03 } x 10⁶</u>	<u>MCF</u>
5	0	0	0	= 0
10	0	0	0	= 0
15	0	0	0	= 0
20 (232-230)	22	5	85,000 x 757	= 64
25 (315-230)	85	18	306,000 x 273	= 115
30 (377-230)	147	32	544,000 x 382	= 287
35 (440-230)	210	46	782,000 x 537	= 580
40 (503-230)	273	59	1,003,000 x 417	= 578
45 (566-230)	336	73	1,241,000 x 349	= 596
50 (629-230)	399	87	1,479,000 x 323	= 660
55 (692-230)	460	100	1,700,000 x 736	= 1729
60				
65				
70				
75				
80				
85				
90				
95				
100				
ALL REMAINING HOURS -				
TOTAL				4636 MCF

GENERAL SPECIFICATIONS

Model	CH - 250	CH - 500
Capacity (Tons) ¹	230	460
COP		
Full load	1.7	1.7
Integrated Part Load Value (IPLV)	2.0	2.0
RPM Full Load	3000	3000
Gas Input (SCFH) ² @ 6 - 28 in. H ₂ O	1750	3500
Recoverable Heat at Full Load (BTU/H) ³	850,000	1,700,000
Acoustic Level (dBA) @ 20 ft. with Optional Enclosure	82	85
Electric Power Requirements	208 VAC Three phase, 35 Amps Service, 4 kW	208 VAC Three phase, 50 Amps Service, 7 kW
Chilled Water Flow (GPM)	600	1200
Cooling Tower Requirements		
Condenser Flow Rate (GPM)	750	1500
Pressure Drop (ft. H ₂ O)	11	11
Temperatures, without Exhaust Heat Exchangers (°F) ³	85.0 - 95.0	85.0 - 95.0
Temperatures, with Exhaust Heat Exchangers (°F) ³	85.0 - 96.3	85.0 - 96.3
Exhaust		
Without Exhaust Heat Exchangers ³	4 in. ANSI Flange, 300 SCFM, 26 in. of water max. back pressure, 1200°F max. temperature	(Same per engine)
With Exhaust Heat Exchangers ³	4 in. ANSI Flange, 300 SCFM, 16 in. of water max. back pressure, 300°F max. temperature	(Same per engine)
Refrigerant	R-11 (1,010 lbs.)	R-11 (1,770 lbs)
TecoDrive™ Engines	One	Two
Rigging Weight (lbs.)	18,000	26,000
Dimensions	14'8" long x 4'11" wide x 7'11" high	15' long x 8' wide x 7'10" high

Note 1. Per ARI 550 - 88 Method
Note 2. HHV 1020 BTU/SCF

Note 3. 60% of heat from engine jacket, exhaust manifold
and oil cooler; 40% from engine exhaust heat exchanger



All specifications and materials subject to change without notice.
All specifications and ratings are +5%

Annual Recurring Maintenance/Repair for Gas Engine-Driven

250 Ton Unit:

Estimated Annual Equivalent Full Load Hours:	5,500/yr.
Air Filter: \$20.00 x 2.2 =	44.00
Oil Filter: \$10.00 x 2.2	22.00
Spark Plugs: \$30.00 x 2.2 =	66.00
PVC Valve: \$15.00 x 2.2 =	33.00
Plug Wires: \$30.00 x 2.2 =	66.00
Oil: \$165 x 2.2 =	363.00
Routine maintenance: 80 hrs @ \$38.00/hr	3,040.00
Oil maintenance: 16 hrs @ \$38.00/hr	<u>608.00</u>
	\$ 4,242.00

500 Ton Unit:

Estimated Annual Equivalent Full Load Hours:	2,200/yr.
Air Filter: \$20 x 1.0 x 2	40.00
Oil Filter: \$10 x 1.0 x 2	20.00
Spark Plugs: \$30 x 1.0 x 2	60.00
PVC Valve: \$15 x 1.0 x 2	30.00
Plug Wires: \$30 x 1.0 x 2	60.00
Oil: \$165 x 1.0 x 2	330.00
Routine maintenance: 120 hrs @ \$38.00/hr	4,560.00
Oil maintenance: 40 hrs @ \$38.00/hr	<u>1,520.00</u>
	\$ 6,620.00



MASSAGLIA-NEUSTROM-BREDSON, INC.
CONSULTING ENGINEERS

JOB Irwin EEAP - Ft. Riley, Kansas

SHEET NO. _____ OF _____

CALCULATED BY MM DATE 4-1992

CHECKED BY RDF DATE 4-1992

JOB NO. 5080

DEMAND SAVINGS - NON-ENERGY ANNUAL RECURRING
BY UTILIZING GAS FIRED CHILLERS FOR
THE BASELOAD INSTEAD OF ELECTRIC
CHILLERS THE DEMAND COST IS REDUCED.
THE MONTHLY DEMAND COST BASED ON
THE ELECTRIC RATE SCHEDULE IS
CALCULATED FOR BOTH TYPES OF CHILLERS.
REFER TO PAGES 10, 11 & 20.

ANNUAL DEMAND COST SAVINGS

ALTERNATIVE 1	77,530
ALTERNATIVE 2	<u>65,538</u>
	\$ 11,992

EQUIVALENT FULL LOAD HOURS FOR MAINTENANCE CALC'S
THE EQUIVALENT FULL LOAD HOURS FOR THE
NEW 250 TON AND 500 TON ENGINE DRIVEN
CHILLERS ARE CALCULATED USING THE SYSTEM
LOAD PROFILE. THE PLANT IS BASELOADED WITH
THE 250 TON CHILLER. THE TOTAL NUMBER OF
COOLING HOURS AT EACH 5% INCREMENT UP
TO 230 ACTUAL TONS IS MULTIPLIED BY THE
CAPACITY AT THAT INCREMENT TO GET TON-HOURS
THEN DIVIDED BY THE UNIT TOTAL CAPACITY OF
230 TONS. AS THE LOAD RISES ABOVE
230 TONS THE 500 TON UNIT IS SEQUENCED
ON NEXT. ABOVE 230 TONS BOTH CHILLERS
ARE ON. THE SAME CALCULATION IS THEN
PERFORMED FOR THE INCREMENTS BETWEEN
230 AND 690 TONS. THE NOMINAL 500 TON UNIT
PROVIDES 460 TONS OF COOLING. THE 250
TON UNIT CONTINUES TO OPERATE FULLY LOADED.
THE ANNUAL RECURRING NON ENERGY MAINTENANCE SAVINGS = 4000\$.

Total Annual Nonenergy Savings due to reduction in electric capacity charge (demand) calculated using the electric rate schedule.

MONTH	EXISTING SYSTEM		MODIFIED SYSTEM		SAVINGS
	BILLING DEMAND (KVA)	DEMAND CHARGE (dollars)	BILLING DEMAND (KVA)	DEMAND CHARGE (dollars)	
JANUARY	1096	4598.80	985	4149.25	449.55
FEBRUARY	1096	4598.80	985	4149.25	449.55
MARCH	1185	4959.25	1036	4355.80	603.75
APRIL	1235	5161.75	1133	4748.65	413.10
MAY	1839	7607.95	1341	5591.05	2016.90
JUNE	2108	8697.40	1741	7211.05	1486.35
JULY	2272	9361.60	1811	7494.55	1867.05
AUGUST	2242	9240.10	1799	7445.95	1794.15
SEPTEMBER	1978	8170.90	1675	6943.75	1227.15
OCTOBER	1274	5319.70	1133	4748.65	571.05
NOVEMBER	1178	4930.90	1035	4351.75	579.15
DECEMBER	1166	4882.30	1034	4347.70	534.60
TOTAL				\$11,992.35	

NONRECURRING SAVINGS/COST

Since the existing Carrier chillers are beyond their useful life, a nonrecurring savings to replace these units will occur in the first year of the study (+\$368,000.00). In the third year of the study the York chiller will be replaced at a cost of (+\$184,000). In the year 4, 8, 12, 16, 20 and 24 a complete engine replacement will be required for the 250 ton chiller at a cost of \$6,000.00 each. In year 9 and 18 complete engine replacement will be required for the 500 ton chiller at a cost of \$12,000.00 each.

T4115080

Trane Air Conditioning Economics

By: MASSAGLIA-NEUSTROM-BREDSON

USED FOR CHILLER PROFILE
HOSPITAL ONLY

V 600

PAGE 1

SYSTEM TOTALS LOAD PROFILE - ALTERNATIVE 1

EXISTING SYSTEMS

----- SYSTEM LOAD PROFILE -----

System Totals

Percent Design Load	---- Cooling Load ----			----- Heating Load -----			---- Cooling Airflow ----			---- Heating Airflow ----		
	Cap. (Ton)	Hours (%)	Hours	Capacity (Btuh)	Hours (%)	Hours	Cap. (Cfm)	Hours (%)	Hours	Cap. (Cfm)	Hours (%)	Hours
0 - 5	62.9	50	4,385	-890,475	43	3,599	17,334.2	0	0	0.0	0	0
5 - 10	125.8	0	0	-1,780,949	8	699	34,668.5	0	0	0.0	0	0
10 - 15	188.7	5	405	-2,671,424	11	902	52,002.7	0	0	0.0	0	0
15 - 20	251.6	9	757	-3,561,899	10	826	69,336.9	0	0	0.0	0	0
20 - 25	314.5	3	273	-4,452,373	8	678	86,671.2	0	0	0.0	0	0
25 - 30	377.4	4	382	-5,342,848	7	608	104,005.4	0	0	0.0	0	0
30 - 35	440.3	6	537	-6,233,322	5	430	121,339.6	0	0	0.0	0	0
35 - 40	503.2	5	417	-7,123,798	4	298	138,673.9	0	0	0.0	0	0
40 - 45	566.1	4	349	-8,014,272	4	317	156,008.1	0	0	0.0	0	0
45 - 50	629.0	4	323	-8,904,748	0	0	173,342.3	0	0	0.0	0	0
50 - 55	691.9	2	196	-9,795,222	0	0	190,676.6	0	0	0.0	0	0
55 - 60	754.8	3	264	-10,685,697	0	0	208,010.8	0	0	0.0	0	0
60 - 65	817.7	2	171	-11,576,172	0	0	225,345.0	0	0	0.0	0	0
65 - 70	880.6	1	109	-12,466,646	0	0	242,679.3	0	0	0.0	0	0
70 - 75	943.5	2	172	-13,357,121	0	0	260,013.5	57	4,985	0.0	0	0
75 - 80	1,006.4	0	20	-14,247,597	0	0	277,347.7	22	1,939	0.0	0	0
80 - 85	1,069.3	0	0	-15,138,071	0	0	294,682.0	9	784	0.0	0	0
85 - 90	1,132.2	0	0	-16,028,546	0	0	312,016.2	2	196	0.0	0	0
90 - 95	1,195.1	0	0	-16,919,022	0	0	329,350.4	2	216	0.0	0	0
95 - 100	1,258.0	0	0	-17,809,496	0	0	346,684.7	7	640	0.0	0	0
Hours Off	0.0	0	0	0	0	403	0.0	0	0	0.0	0	8,760

1

MNB

MASSAGLIA-NEUSTROM-BREDSON, INC.
CONSULTING ENGINEERS

JOB Irwin EEAP - Ft. Riley, Kansas

SHEET NO. _____ OF _____

CALCULATED BY MM DATE 4-1992

CHECKED BY RDF DATE 4-1992

JOB NO. 5080

MAINTENANCE EQUIVALENT FULL LOAD HOURS 250 TON CHILLER

<u>% DESIGN</u>	<u>CAPACITY x HOURS ÷</u>	<u>TOTAL =</u>	<u>EFLH</u>
	<u>TONS</u>	<u>TONS</u>	
5	62.9 4385	230	1199
10	125.8 0	230	0
15	188.7 405	230	332
20	251.6 (230) 3970	230	3970
TOTAL			5501

ALL REMAINING HOURS

500 TON CHILLER

<u>% DESIGN</u>	<u>CAPACITY x HOURS ÷</u>	<u>TOTAL =</u>	<u>EFLH</u>
	<u>TONS</u>	<u>TONS</u>	
20	251.6-230 757	460	36
25	314.5-230 273	460	66
30	377.4-230 382	460	122
35	440-230 537	460	245
40	503-230 417	460	247
45	566.1-230 349	460	255
50	629-230 323	460	280
55	691.9-230 (460) 932	460	932
TOTAL			2183

ALL REMAINING HOURS

COST ESTIMATE ANALYSIS										EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 5-800-2; the proponent agency is USACE.										MARCH 1992		MARCH 18, 1992	
PROJECT IRWIN ARMY COMMUNITY HOSPITAL - EEAP										DRAWING NO.		SHEET 1 OF 2 SHEETS	
LOCATION FORT RILEY, KANSAS										ESTIMATOR WAB		CHECKED BY R. D. FRYMIRE	
TASK DESCRIPTION	QUANTITY		LABOR		EQUIPMENT		MATERIAL		TOTAL	SHIPPING			
	NO. OF UNITS	UNIT MEAS	MH	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST		UNIT WT	TOTAL WT		
RECAP!													
SHEET 2 OF 4						14650		2400	471900	494950			
SHEET 3 OF 4						3950		1050	6500	11500			
SHEET 4 OF 4						7000		4200	7000	18200			
Sub total													
SUB CONTRACTOR						25,600		13650	485400	524650			
Sub total										52465			
PRIME CONTRACTOR										577115			
PRIME CONTRACTOR										69254			
CONSTRUCTION COST										46169			
										692538			
SIOH @ 6%										41552			
TOTAL THIS SHEET										734090			

COST ESTIMATE ANALYSIS										INVIATION/CONTRACTOR		EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 8-800-2; the proponent agency is USACE.										MARCH 1992		MARCH 18, 1992			
PROJECT		IRWIN ARMY COMMUNITY HOSPITAL - EEAP								CODE (Check one)		DRAWING NO.		SHEET 2 OF 4 SHEETS	
LOCATION		FORT RILEY, KANSAS								<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> OTHER		ESTIMATOR		CHECKED BY	
												WAB		R. D. FRYMIRE	
TASK DESCRIPTION	QUANTITY		MH	LABOR		EQUIPMENT		MATERIAL		TOTAL	SHIPPING				
	NO. OF UNITS	UNIT MEAS		UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST		UNIT WT	TOTAL WT			
OPTION No. 3															
FURNISH & INSTALL THE															
FOLLOWING:															
GAS ENGINE															
DRIVEN CHILLER															
WITH HEAT RECOVERY															
250 TON	1	EA		5K	5000.	4K	4000.	175K	175000.	184000.					
450 TON	1	EA		7K	7000.	4K	4000.	290K	290000.	301000.					
PUMPS	2	EA		500.	1000.	100.	200.	3K	6000.	7200.					
PRING; "INCLUDES HANGERS, SUREDS, INSULATION" - CHILLED WATER															
6" CWS & CWR 50 LF				15.	750.	2.	100.	7.	350.	1200.					
8" CWS & CWR 150 LF				18.	900.	2.	100.	11.	550.	1550.					
TOTAL THIS SHEET					14650.		8400.		471900.	494950.					

COST ESTIMATE ANALYSIS										INVOITATION/CONTRACTOR		EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 5-900-2; the proponent agency is USACE.										MARCH 1992		MARCH 18, 1992			
PROJECT IRWIN ARMY COMMUNITY HOSPITAL - EEAP										CODE (Check one) <input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C		DRAWING NO.		SHEET 3 OF 4	
LOCATION FORT RILEY, KANSAS										<input type="checkbox"/> OTHER		ESTIMATOR WAB		CHECKED BY R. D. FRYMIRE	
TASK DESCRIPTION	QUANTITY		MH	TOTAL HRS	LABOR		EQUIPMENT		MATERIAL		SHIPPING				
	NO. OF UNITS	UNIT MEAS			UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	UNIT WT	TOTAL WT			
PIPING: "INCLUDES HANGERS" - CONDENSER WATER															
6" CR & CS	100	LF			2.	200.	2.	200.	3.	300.		1900.			
8" CR & CS	100	LF			2.	200.	2.	200.	4.	400.		800.			
10" " "	150	LF			3.	450.	3.	450.	4.	600.		1500.			
EMCS:															
CONTROLS & WIRING	1	LS			2K	2000.		-	4K	4000.		6000.			
GAS CONN'S - INCLUDES METERS, VALVES,															
REGULATORS & PIPE	1	LS			1K	1000.	200.	200.	1K	1000.		2200.			
ELEC CONN'S															
	1	LS			100.	100.		-	200.	200.		300.			
TOTAL THIS SHEET															
						3950.		1050.		6500.		11500.			

COST ESTIMATE ANALYSIS										EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 5-900-2; the proponent agency is USACE.										MARCH 1992		MARCH 18, 1992	
PROJECT IRWIN ARMY COMMUNITY HOSPITAL - EEAP										DRAWING NO.		SHEET 4 OF 4 SHEETS	
LOCATION FORT RILEY, KANSAS										ESTIMATOR WAB		CHECKED BY R. D. FRYMIRE	
TASK DESCRIPTION	QUANTITY		MH	LABOR		EQUIPMENT		MATERIAL		SHIPPING			
	NO. OF UNITS	UNIT MEAS		UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL	UNIT WT	TOTAL WT	
DEMOLITION OF													
EXIST. CHILLERS,													
PIPE, FITTING,													
ASSOCIATED EQUIPMENT,													
WIRING, CONDUIT,													
CONTROLS, CONTROL													
WIRING, ETC	1	LS		5K	5000.	4K	4000.	2K	2000.	11000.			
PUMP: ELEC.													
CONN'S - INCLUDES WIRE, CONDUIT, BRK'S,													
MCC CONTROLS	1	LS		1K	1000.		—	2K	2000.	3000.			
VALVES	1	LS		1K	1000.	200.	200.	3K	3000.	4200.			
TOTAL THIS SHEET					7000		4200.		7000	18,200			

installation: IRWIN ARMY COMMUNITY HOSPITAL, FT. RILEY, KANSAS

project: ENERGY ENGINEERING ANALYSIS PROGRAM (EEAP)

project number
temporary: _____ program year _____

permanent: _____ category code _____

point of contact:

user
name Maj. James Fletcher date 28 August 1991

title Chief of Logistics phone (913) 239-7207

autovon _____

dfae
name Larry Stillwagon date 20 August 1991

title Base Energy Officer phone (913) 239-2371

autovon _____

engineer district
name Robert Miller date 28 August 1991

title Project Manager phone (816) 426-2782

autovon _____

other (A-E)
name Randall D. Frymire date 27 August 1991

title Project Manager phone (816) 931-2200

autovon _____

reviewed by:

installation facility engineer
name Larry Stillwagon date 28 August 1991

title Base Energy Officer phone (913) 239-2371

autovon _____

approved by:

macom engineer
name _____ date _____

title _____ phone _____

autovon _____

project development brochure, PDB-1

facility

IRWIN ARMY COMMUNITY HOSPITAL
FT. RILEY, KANSAS

project coordinator for using service

LARRY STILLWAGON
BASE ENERGY OFFICER

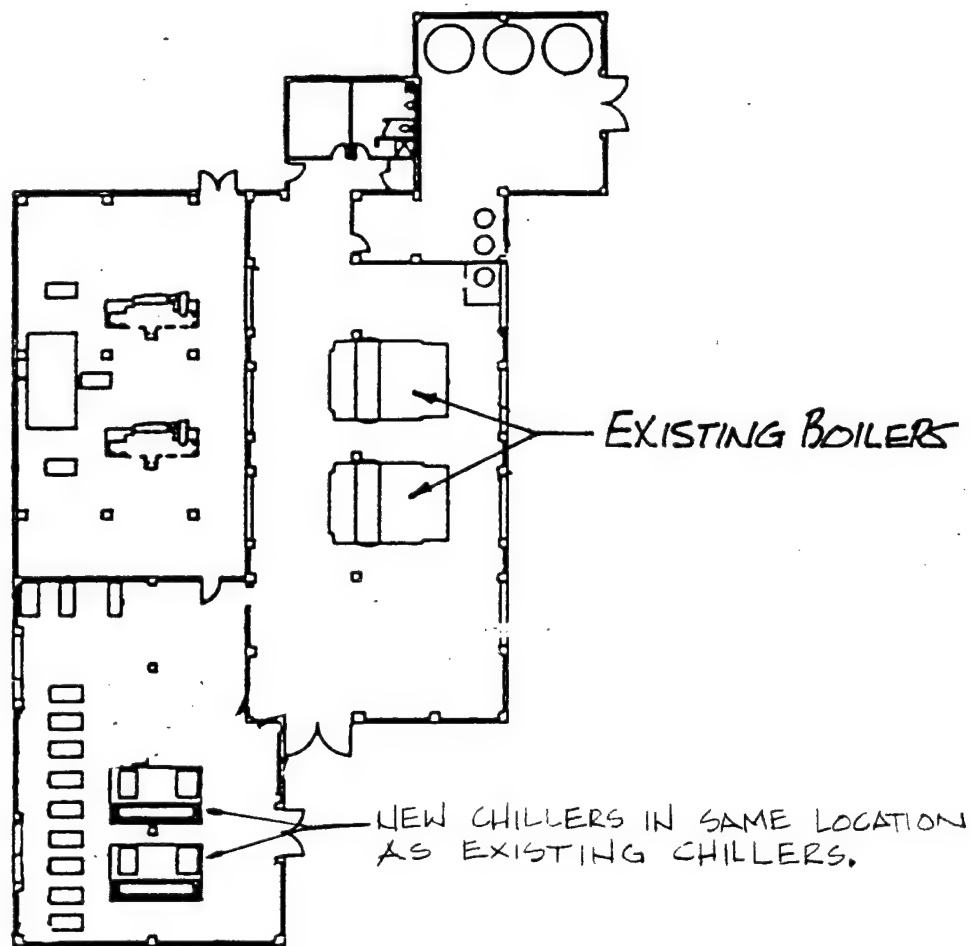
functional requirements summary, PDB-1

DA FORM 5020-1-R, Feb 82

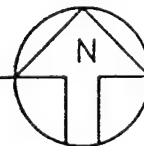
OBJECTIVE

The objective of this project is to remove three 200 ton steam centrifugal chillers and replace them with one 250 ton and one 500 ton gas-fired engine-driven chillers in the hospital energy plant. The new units will provide base load cooling and greater efficiency in the off-peak season.

functional requirements summary, PDB-1



ENERGY PLANT FLOOR PLAN



facilities requirements sketch, PDB- 1/2

A. SPECIAL CONSIDERATIONS

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
A-1	Cost estimates for each primary and supporting facility	B			✓
A-2	Telecommunications system coordination with USACC and authorization for exceptions	NR			
A-3	Coordination with state and local governmental requirements (blind vendors, medical facilities, construction and operating permits, clearinghouse coordination, etc.)	NR			
A-4	Assignment of airspace	NR			
A-5	Economic analysis of alternatives	NR			
A-6	Approval for new starts	NR			
A-7	International balance of payments (IBOP) coordination with U.S. European command and NATO—overseas cost estimates and comparables (include rate of exchange used in estimates)	NR			
A-8	Impact on historic places—on site survey by authorized archeologist and coordination with state historic preservation officer and advisory council on historic preservation	NR			
A-9	Exceptions to established criteria	NR			
A-10	Coordination with various staff agencies (Provost Marshall-physical security, etc.)	NR			
A-11	Identification of related or support projects (so projects can be coordinated)	NR			
A-12	Required completion date	NR			
Other Special Considerations (List and number items)					

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently available. Enter code for information source.

COMMENT ATTACHED — Significant information summarized or explained and attached.

DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

*** BY WHOM** (Check and insert appropriate letter)

A — DFAE

B — Using Service

C — Construction Service

D — Designer

E — Other (Check Comments Attached and explain)

documentation checklist

B. SITE DEVELOPMENT

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
B-1	Consultation with the District Office to determine and evaluate flood plain hazards				
B-2	Preparation, submission, and/or approval of new				
(A)	General Site Plan	NR			
(B)	Annotated General Site Plan	NR			
(C)	Sketch Site Plan	NR			
(D)	Facilities Requirements Sketch	NR			
B-3	Preparation of				
(A)	Site Survey	NR			
(B)	Subsoil information	NR			
B-4	Approval by Department of Defense Explosive Safety Board (DDESB) for Safety Site Plan	NR			
	Other Site Development Considerations (List and number items)	NR			

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

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documentation checklist

DA FORM 5023-B-R, Feb 82

C. ARCHITECTURAL & STRUCTURAL

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
C-1	Reconciliation with troop housing programs and requirements	NR			
C-2	Evaluation of existing facilities (including degree of utilization)	NR			
C-3	Approval for removal and relocation of existing useable facilities	NR			
C-4	Evaluation of off-post community facilities	NR			
C-5	Storage and maintenance facilities (including nuclear weapons)	NR			
C-6	Coordination hospitals, medical and dental facilities with Surgeon General	NR			
C-7	Coordination of aviation facilities with FAA	NR			
C-8	Coordination air traffic control and navigational aids with USACC	NR			
C-9	Tabulation of types and numbers of aircraft	NR			
C-10	Evaluation of laboratory, research and development, and technical maintenance facilities	NR			
C-11	Coordination chapels with Chief of Chaplains	NR			
C-12	Review food service facilities by USATSA	NR			
C-13	Automated data processing system or equipment approvals—cost analysis when ADP and/or communication centers not co-located with related facilities	NR			
C-14	Coordination postal facilities with U.S. Postal Service Regional Director	NR			
C-15	Laundry and dry cleaning facilities coordination with ASD(I&L)	NR			
C-16	Tenant facilities coordination with installation where sited	NR			
C-17	Facilities for or exposed to explosions, toxic chemicals, or ammunition—review by DDESB (See also Item B-4)	NR			
C-18	Analysis of deficiencies	NR			
C-19	Consideration of alternatives	NR			
C-20	Determination whether occupants will include physically handicapped or disabled persons	NR			
C-21	As-build drawings for alterations or additions	NR			
C-22	Availability of Standard Design or site adaptable designs	NR			
	Other Architectural & Structural (List and number items)	NR			

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently available. Enter code for information source.

COMMENT ATTACHED — Significant information summarized or explained and attached.

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- A — DFAE
- B — Using Service
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- D — Designer
- E — Other (Check Comments Attached and explain)

documentation checklist

D. MECHANICAL, ELECTRICAL, & UTILITY SYSTEMS

ITEM		Required or Not Required	* To Be Determined	Comment Attached	Document Attached
D-1	Fuel considerations and cost comparison analysis	NR			
D-2	Energy requirements appraisal (ERA)	NR			
D-3	Conformance with DOD Energy Reduction requirements	NR			
D-4	Evaluation of existing and/or proposed utility systems	NR			
	Other Mechanical and Utility Systems (List and number items)	NR			

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently available. Enter code for information source.

COMMENT ATTACHED — Significant information summarized or explained and attached.

DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

***BY WHOM** (Check and insert appropriate letter)

- A — DFAE
- B — Using Service
- C — Construction Service
- D — Designer
- E — Other (Check Comments Attached and explain)

documentation checklist

DA FORM 5023-D-R, Feb 82

E. ENVIRONMENTAL CONSIDERATIONS

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
E-1	Environmental impact assessment	NR			
E-2	EIA conclusions require Environmental Impact Statement	NR			
E-3	Determination of health, environmental or related hazards. Assistance to determine existence of any health, environmental or related hazard may be requested from Aberdeen Proving Ground, MD 21010, the Office of the Surgeon General, Attn: DASG-HCH (Army Environmental Hygiene Agency)	NB			
E-4	Air/water pollution permit, coordination with agencies and compliance with standards at Federal, state and local level	NR			
E-5	Corrective measures associated with Environmental Impact Statements or assessment—list separately and evaluate.	NR			
	Other environmental considerations (list and number items)	NR			

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently available. Enter code for information source.

COMMENT ATTACHED — Significant information summarized or explained and attached.

DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

*** BY WHOM** (Check and insert appropriate letter)

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- D — Designer
- E — Other (Check Comments Attached and explain)

documentation checklist

DA FORM 5023-E-R, Feb 82

A. SPECIAL CONSIDERATIONS

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
A-1	Factors of risk, restriction or unusual circumstance expected to increase costs beyond applicable area averages	NR			
A-2	Construction phasing requirements	B	D		
A-3	Functional support equipment (mechanical, electrical, structural, and security) to be built in	NR			
A-4	Equipment in place and justification	NR			
A-5	Other equipment and furniture (O&MA, OPA) and costs	NR			
A-6	Special studies and tests (hazards analyses, compatibility testing, new technology testing, etc.)	NR			
A-7	Type of construction (permanent, temporary, semi-permanent)	NR			
A-8	Government furnished equipment (quantities, procurement time, availability and special handling and storage requirements). Funds used for procurement.	NR			
	Other special considerations (list and number items)	NR			

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently available. Enter code for information source.

COMMENT ATTACHED — Significant information summarized or explained and attached.

DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

***BY WHOM** (Check and insert appropriate letter)

A — DFAE

B — Using Service

C — Construction Service

D — Designer

E — Other (Check Comments Attached and explain)

technical data checklist

B. SITE DEVELOPMENT		Required or Not Required	To Be Determined	Comment Attached	Document Attached
ITEM					
B-1	Construction restrictions or guidelines pertaining to site access and preferred construction routes	NR			
(A)					
(B)	Airfield clearance, explosive storage, working hours, safety, etc.	NR			
(C)	Facilities and/or functions or adjoining areas (structures, materials, impact)	NR			
B-2	Real estate actions (acquisition, disposal, lease, right-of-way)	NR			
B-3	Demolition/relocation required (data)				
(A)	Special considerations due to explosives/radioactivity/chemical contamination/asbestos emissions/toxic gases	NR			
(B)	Restrictions on disposal of demolished/relocated material including hazardous waste	NR			
B-4	Pavement types and requirements (including traffic surveys and MTMC coordination)	NR			
B-5	Landscape considerations				
(A)	Protection of existing vegetation	NR			
(B)	Stockpile topsoil	NR			
	Other Site Development (List and number items)	NR			

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently available. Enter code for information source.

COMMENT ATTACHED — Significant information summarized or explained and attached.

DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

***BY WHOM** (Check and insert appropriate letter)

- A — DFAE
- B — Using Service
- C — Construction Service
- D — Designer
- E — Other (Check Comments Attached and explain)

technical data checklist

C. ARCHITECTURAL & STRUCTURAL

ITEM		Required or Not Required	To Be Determined *	Comment Attached	Document Attached
C-1	Vibration-producing equipment requiring isolation	R	D		
C-2	Seismic zone and other design load criteria (typhoon, hurricane, earthquake loads, high or low loss potential)	R	D		
C-3	Protective shelter evaluation and resistant design criteria (conventional/nuclear blast and radiation, chemical/biological)	NR			
C-4	Unusual foundation requirements (pier, pile, caisson, deep foundations, mat, special treatment, permafrost areas, soil bearing)	NR			
C-5	Designation and strength of units to be accommodated	NR			
C-6	Requirements and data for special design projects	NR			
C-7	Unusual floor and roof loads (safes, equipment)	NR			
C-8	Security features (arms rooms, vaults, interior secure areas)	NR			
	Other Architectural & Structural (List and number items)	NR			

REQUIRED OR NOT REQUIRED – Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED – Information needed but not currently available. Enter code for information source.

COMMENT ATTACHED – Significant information summarized or explained and attached.

DOCUMENT ATTACHED – Significant information is in an existing document which is attached.

***BY WHOM** (Check and insert appropriate letter)

A – DFAE

B – Using Service

C – Construction Service

D – Designer

E – Other (Check Comments Attached and explain)

technical data checklist

D. MECHANICAL, ELECTRICAL, & UTILITY SYSTEMS

ITEM		Required or Not Required	* To Be Determined	Comment Attached	Document Attached
D-1	Special mechanical requirements or considerations (elevator, crane, hoist, etc.)	NR			
D-2	Special peak usage periods and peak leveling techniques	NR			
D-3	Maintenance considerations (accessibility of equipment, compatibility with existing equipment)	R	D		
D-4	Plumbing—availability, general system type and characteristics (proposed and/or existing, incl. compressed air and gas)	E	D		
D-5	Heating—availability, general system type and characteristics (proposed and/or existing)	NR			
D-6	Ventilating, air condition/refrigeration—availability, general system type and characteristics (proposed and/or existing)	NR			
D-7	Electrical—availability, general system type and characteristics incl. airfield lighting, communication, etc. (proposed and/or existing)	R	D		
D-8	Water supply/waste treatment—availability, general system type and characteristics (proposed and/or existing)	NR			
D-9	Energy requirements/fuel conversion (sources, availability, loads, types of fuel, etc.)	B	D		
D-10	Solar energy evaluation	NR			
	Other Mechanical & Utility Systems (List and number items)	NR			

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently available. Enter code for information source.

COMMENT ATTACHED — Significant information summarized or explained and attached.

DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

*** BY WHOM** (Check and insert appropriate letter)

A — DFAE

B — Using Service

C — Construction Service

D — Designer

E — Other (Check Comments Attached and explain)

technical data checklist

E. ENVIRONMENTAL CONSIDERATIONS

ITEM		Require Not Re	To Be Determin	Comm Attach	Docum Attach
E-1	Waste water treatment, air quality, and solid waste disposal criteria	✓			
	Other Environmental Considerations (List and number items)	✓			

REQUIRED OR NOT REQUIRED - Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED - Information needed but not currently available.
Enter code for information source.

COMMENT ATTACHED – Significant information summarized or explained and attached.

DOCUMENT ATTACHED - Significant information is in an existing document which is attached.

*** BY WHOM (Check and insert appropriate letter)**

- A - DFAE
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E - Other (Check Comments Attached and explain)

technical data checklist

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F. FIRE PROTECTION

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
F-1	Special fire protection systems or features (detection and suppression equipment, hazards, etc.)	NR			
	Other Fire Protection Considerations (List and number items)	NR			

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently available. Enter code for information source.

COMMENT ATTACHED — Significant information summarized or explained and attached.

DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

*** BY WHOM** (Check and insert appropriate letter)

- A — DFAE
- B — Using Service
- C — Construction Service
- D — Designer
- E — Other (Check Comments Attached and explain)

technical data checklist

COST ESTIMATE ANALYSIS				INVOITATION/CONTRACTOR				EFFECTIVE PRICING DATE				DATE PREPARED			
For use of this form, see TM 8-900-2; the proponent agency is USACE.								MARCH 1992				MARCH 18, 1992			
PROJECT IRWIN ARMY COMMUNITY HOSPITAL - EEAP				CODE (Check one) <input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C				DRAWING NO.				SHEET 1 OF 2 SHEETS			
LOCATION FORT RILEY, KANSAS				<input type="checkbox"/> OTHER				ESTIMATOR WAB				CHECKED BY R. D. FRYMIRE			
TASK DESCRIPTION	QUANTITY		MH	LABOR		EQUIPMENT		MATERIAL		TOTAL	SHIPPING				
	NO. OF UNITS	UNIT MEAS		UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST		UNIT WT	TOTAL WT			
RECAP!															
SHEET 2 OF 4					14650		8400		471900	494950					
SHEET 3 OF 4					3950		1050		6500	11500					
SHEET 4 OF 4					7000		4200		7000	18200					
Sub total					25,600		13650		485400	524650					
SUB CONTRACTOR			10%							52465					
Sub total										577115					
PRIME CONTRACTOR			12%							69254					
PRIME CONTRACTOR			PROF & CONTO 8%							46169					
CONSTRUCTION COST										692538					
SI OH @ 6%										41552					
TOTAL THIS SHEET										734090					

DA FORM 5418-R, Apr 86

COST ESTIMATE ANALYSIS										INVOITATION/CONTRACTOR		EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 8-800-2; the proponent agency is USACE.										MARCH 1992		MARCH 18, 1992			
PROJECT IRWIN ARMY COMMUNITY HOSPITAL - EEAP										CODE (Check one) <input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C		DRAWING NO.		SHEET 2 OF 4 SHEETS	
LOCATION FORT RILEY, KANSAS										<input type="checkbox"/> OTHER		ESTIMATOR WAB		CHECKED BY R. D. FRYMIRE	
TASK DESCRIPTION	QUANTITY NO. OF UNITS	MH UNIT MEAS	TOTAL HRS	LABOR		EQUIPMENT		MATERIAL		TOTAL	SHIPPING				
				UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST		UNIT WT	TOTAL WT			
OPTION No. 3															
FURNISH & INSTALL THE															
FOLLOWING:															
GAS ENGINE															
DRIVEN CHILLER															
WITH HEAT RECOVERY															
250 TON	1	EA		5K	5000.	4K	4000.	175K	175000.	184000.					
450 TON	1	EA		7K	7000.	4K	4000.	290K	290000.	301000.					
PUMPS	2	EA		500.	1000.	100.	200.	3K	6000.	7200.					
PPING; INCLUDES HANGERS, SHIELDS, INSULATION - CHILLED WATER															
6" CWS & CWR 50 LF				15.	750.	2.	100.	7.	350.	1200.					
8" CWS & CWR 50 LF				18.	900.	2.	100.	11.	550.	1550.					
TOTAL THIS SHEET					14650.		8400.		471900.	494950.					

COST ESTIMATE ANALYSIS										INVOITATION/CONTRACTOR		EFFECTIVE PRICING DATE		DATE PREPARED	
For use of this form, see TM 5-800-2; the proponent agency is USACE.										MARCH 1992		MARCH 18, 1992			
PROJECT IRWIN ARMY COMMUNITY HOSPITAL - EEAP										DRAWING NO.				SHEET 3 OF 4 SHEETS	
LOCATION FORT RILEY, KANSAS										ESTIMATOR WAB		CHECKED BY R. D. FRYMIRE			
TASK DESCRIPTION		QUANTITY		LABOR		EQUIPMENT		MATERIAL		SHIPPING					
		NO. OF UNITS	UNIT MEAS	MH UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	TOTAL	UNIT WT	TOTAL WT		
PIPING: "INCLUDES HANGERS" - CONDENSER WATER															
6" CR & CS	100	LF			2.	200.	2.	200.	3.	300.		100.			
8" CR & CS	100	LF			2.	200.	2.	200.	4.	400.		800.			
10" " "	150	LF			3.	450.	3.	450.	4.	600.		1500.			
EMCS:															
Controls & Wiring	1	LS			2K	2000.		-	4K	4000.		6000.			
GAS CONN'S - INCLUDES METERS, VALVES,															
Regulators & Pipe	1	LS			1K	1000.	200.	200.	1K	1000.		2200.			
ELEC CONN'S															
	1	LS			100.	100.		-	200.	200.		300.			
TOTAL THIS SHEET															
										3950.	1050.	6500.	11500.		

COST ESTIMATE ANALYSIS				INVESTMENT/CONTRACTOR				EFFECTIVE PRICING DATE				DATE PREPARED			
For use of this form, see TM 5-800-2; the proponent agency is USACE.								MARCH 1992				MARCH 18, 1992			
PROJECT IRWIN ARMY COMMUNITY HOSPITAL - EEAP				CODE (Check one) <input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C				DRAWING NO.				SHEET 4 OF 4 SHEETS			
LOCATION FORT RILEY, KANSAS				<input type="checkbox"/> OTHER				ESTIMATOR WAB				CHECKED BY R. D. FRYMIRE			
TASK DESCRIPTION	QUANTITY		MH	LABOR		EQUIPMENT		MATERIAL		SHIPPING					
	NO. OF UNITS	UNIT MEAS		UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	UNIT WT	TOTAL WT				
DEMOLITION OF															
EXIST. CHILLERS,															
PIPE, FITTING,															
ASSOCIATED EQUIPMENT,															
WIRING, CONDUIT,															
CONTROLS, CONTROL															
WIRING, ETC	1	LS		5K	5000.	4K	4000.	2K	2000.		11000.				
PUMP: ELEC.															
CONN'S - INCLUDES WIRE, CONDUIT, BRK'S,															
MCC CONTROLS	1	LS		1K	1000.		—	2K	2000.		3000.				
VALVES	1	LS		1K	1000.	200.	200.	3K	3000.		4200.				
TOTAL THIS SHEET					7000		4200.		7000		18,200				